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Hydromedusae of the Agulhas Current

by

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ABSTRACT

Sixty-five species of hydromedusae are described from archived zooplankton collections made along the east coast of South Africa. Although the accounts are not illustrated, the diagnostic characters of each species are highlighted and supplementary information that allows ready separation from related taxa is provided. Trachy- and Narcomedusae dominate collections, but Antho- and Leptomedusae are more diverse. Nineteen species are new records for the south-east Indian Ocean, whilst a further 11 species represent new records for the Indian Ocean as a whole. No new species can be described owing to the generally poor condition of the material. The fauna has predominately warm water affinities, and is largely composed of panoceanic taxa or those with a known Indo-Pacific centre of distribution. The invasive *Blackfordia virginica* is reported from the region for the first time. Three cold-water species (*Plotocnide incerta, Laodicea pulchra* and *Cosmetirella davisi*) are reported.

KEY WORDS: Cnidaria, Medusae, Hydromedusae, South Africa, Indian Ocean, Agulhas Current, new records, taxonomy.

INTRODUCTION

Of the three classes that constitute the superclass Hydrozoa, only Hydroidomedusa and Automedusa regularly contribute 'medusae' to the plankton (Bouillon & Boero 2000*a*; http://siba2.unile.it/thalassiasal). Most medusae are meroplanktic, and holopelagic species (with the exception of Siphonophorae: Hydroidomedusa) belong to the subclasses Trachymedusa and Narcomedusa within Automedusa (Bouillon & Boero 2000*b*). The diversity of hydromedusae is, by zooplankton standards (Gibbons *et al*., unpublished), relatively high and some 842 species are currently recognised (Bouillon & Boero 2000*b*). They are often common components of oceanic and (especially) coastal zooplankton assemblages (Mills 1995), and under certain circumstances they are thought to have a profound impact on their food environment (Purcell 1991; Purcell & Arai 2001).

Our understanding of medusan assemblages along the west and south-west coasts (including the Benguela Current) of southern Africa is fairly good (Pagès *et al*. 1991; Pagès & Gili 1991, 1992; Pagès 1992; Buecher & Gibbons 2000; Gibbons & Buecher 2001; Sparks & Gibbons 2003), largely because Pagès *et al*. (1992) have provided a basic taxonomic account of the species that can be found there. The same cannot be said for our understanding along the east coast of South Africa (including the Agulhas Current), because the basic groundwork in terms of species identification is lacking. That is not to say we are totally ignorant, as occasional records from the tropical west Indian Ocean and off Mozambique can be found in the literature (see data in Kramp 1961, 1965, 1968; Bouillon 1978*b*), and other information can be gleaned from the distribution of benthic polyps (Millard 1975).

The Agulhas Current is the major western boundary current in the southern Indian Ocean (Lutjeharms 1996). It is composed primarily of Indian Subtropical Surface Water, although Indian Tropical Surface Water may be present on its landward side (Gordon *et al.* 1987). The current is remarkably aseasonal in its chemical (e.g. Pearce & Gründlingh 1982) and thermal characteristics and reaches a maximum of approx. 28 °C. The core of the current follows the edge of the shelf, which is close to the shore in the north, and moves gradually offshore to the southwest and along the edge of the Agulhas Bank—it retroflects off Cape Agulhas. Although the current has a very stable trajectory between Durban and Port Elizabeth (Gründlingh 1983), filaments, eddies and rings may form and be shed along the south coast of South Africa. These can make their way into the South Atlantic Ocean (Lutjeharms 1996). Intrusions onto the shelf happen with no clear pattern. Shelf-edge upwelling on the inshore side of the Agulhas Current is a typical feature that occurs almost exclusively in the Port Alfred upwelling cell (Lutjeharms *et al.* 2000), where cooler Indian Ocean Central Water is moved onto the shelf and occasionally outcrops at the sea surface.

Although the Agulhas Current plays an influential role in global surface circulation and heat flux, apart from a few mainly descriptive studies on copepods (De Decker 1973), chaetognaths (Stone 1969; Schleyer 1977) and siphonophores (Thibault-Botha *et al.* 2004; Thibault-Botha & Gibbons 2005) we are largely ignorant of its biota. In this article, we present the first list of hydromedusae recorded from along the east coast of South Africa, including material that was collected from the Agulhas Current. This work is intended to complement that of Pagès *et al.* (1992) and it contributes a baseline that should allow us to increase our knowledge and understanding of the general distribution of medusae in the region.

MATERIAL AND METHODS

The material examined was obtained from archived samples that were collected during three ichthyoplankton cruises conducted along the east coast of South Africa during autumn (May) and spring (October) in 1990, and summer (February) in 1991. Full details of the sampling program and methodology can be found in Beckley and van Ballegooyen (1992). The surveys extended across the shelf from between Algoa Bay in the south (34ºS:26ºE) to the Tugela River mouth in the north (29ºS:31ºE) (Fig. 1). Samples were collected at four depth-stations (approx. 50 m, 100 m, 500 m and 2000 m) across nine transects, using Bongo nets (57 cm mouth diameter) fitted with 500 µm mesh. Nets were towed obliquely over the upper 80 m (40 m for the shallow stations) at 1 m s^{-1}. The volume of water filtered by each net averaged 196.8 m^3. On retrieval, all samples were preserved in 5% saline formalin. A total of 106 samples were sorted and all medusae were counted and identified, where possible, using a dissecting microscope at variable magnification.

The classification system used here follows that of Bouillon and Beoro (2000*b*). For each species, we provide a short morphological description that highlights (in bold typeface) the diagnostic features. We do not explicitly, and separately, describe the more general characters that are used to identify Classes, Subclasses and Families, as these can readily be found in Kramp (1961), or Bouillon and Boero

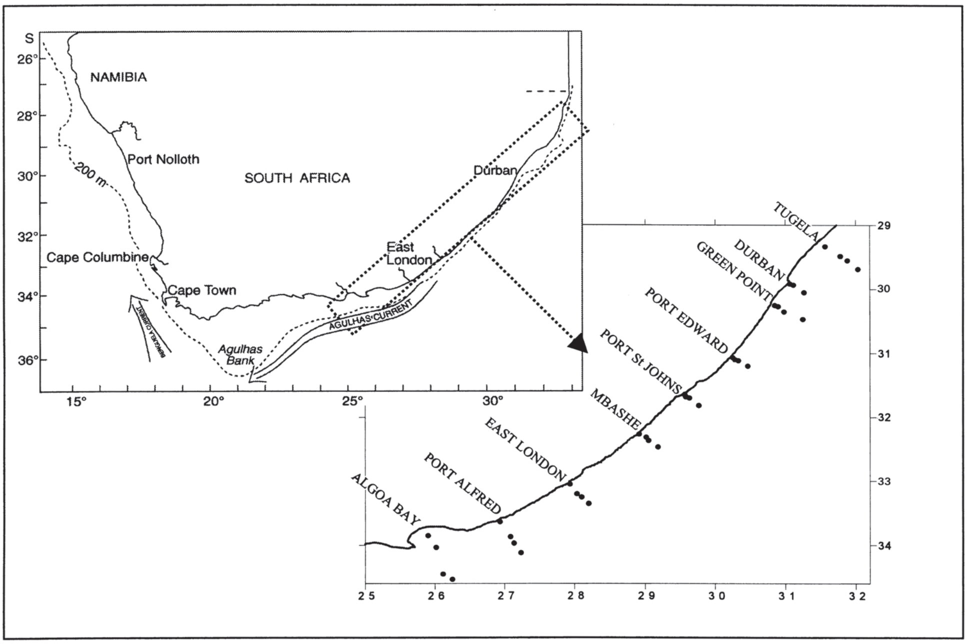

Fig. 1. South African coastline with the 200 m isobath. The study area along the east coast and the sampling stations are shown with details.

(2000*b*), though these features may be incorporated into species descriptions to facilitate identification. Kramp (1961) provides a useful list of synonymies and only when these differ from the more recent work of Bouillon and Boero (2000*b*), do we provide supplementary information, in an abbreviated format. For each species we refer the reader to the account in Kramp (1961) as well as to at least one illustrated description (often the type description for more recently described material). Illustrations are not provided because almost all of the present material was damaged during collection; a situation that was exacerbated by the fact that there was also a 12 year delay between sample collection and specimen identification. As noted, however, the key references cited for each species are illustrated, and the reader is urged to consult them. Under 'Material examined', the catalogue numbers for material deposited at the South African Museum (Cape Town) are provided for all species. The number of specimens recovered and examined is indicated in the description. We have provided a brief commentary for each species, which essentially highlights the diversity of the genus and indicates the characters that can be used to distinguish between species. Generally we have not discussed the validity of the described material, unless specimens are conspicuously extralimital. The distribution of each species across the region is summarised in tabular form (Table 1), but supplementary information concerning global distribution is provided using the data in Kramp (1961) and Bouillon (1999). Where distribution records are not supported by a literature citation, the reader is referred to Kramp (1961). We have highlighted previous records from the region where appropriate.

Superclass Hydrozoa
Class Automedusae Lameere, 1920 emended
Subclass Narcomedusae Haeckel, 1879
Family Aeginidae Gegenbaur, 1857, emend. Maas, 1904
Aeginura grimaldii Maas, 1904

Aeginura grimaldii: Maas 1904: 38; Kramp 1961: 269; 1968: 124, fig. 335.

Description: Eight specimens from seven stations. Umbrella hemispherical, slightly broader than tall; up to 22 mm in diameter. Exumbrella smooth. Mesoglea thickened apically, thinning laterally. Velum broad. Eight equally-well developed peronia. Eight tentacles arising from within mesoglea, above level of stomach, solid, characteristically banded. With three secondary tentacles (per octant) on umbrella margin. Mouth simple, circular. **Sixteen quadrangular gastric pouches**. Peripheral canal absent. Statocysts between secondary tentacles, numerous, without otoporpae. Gonads associated with gastric pouches.

Material examined: H4979.

Comments: One of two species (Bouillon & Boero 2000*b*); the other, *A. beebei* Bigelow, 1940 is restricted to east tropical Pacific. Species can be distinguished by the number of gastric pouches.

Distribution: Cosmopolitan. Previously recorded along the east coast of Africa (Kramp 1965). Bathypelagic.

Aegina citrea Eschscholtz, 1829

Aegina citrea: Eschscholtz 1829: 113, 115; Kramp 1961: 266; 1968: 124, fig. 334.

Description: Six immature specimens from four stations. Bell-shaped umbrella, slightly broader than tall; up to 12 mm in diameter. Exumbrella smooth. Mesoglea thickened dorsally but thin laterally. Velum broad. Four equally well-developed peronia, four lappets. Four tentacles arising from within mesoglea, solid, characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Eight quadrangular gastric pouches, situated below level of tentacles. Peripheral canal present. Numerous statocysts, without otoporpae. When mature, gonads associated with gastric pouches.

Material examined: H4980.

Comments: This is the only species in this genus.

Distribution: World-wide in temperate and warm waters. Previously recorded off Madagascar (Vanhöffen 1912) and the Chagos Archipelago (Browne 1916). Eurybathic.

Solmundella bitentaculata Quoy & Gaimard, 1833

Solmundella bitentaculata: Quoy and Gaimard 1833: 295, figs 4, 5; Kramp 1961: 270; 1968: 124, fig. 338.

Description: 144 specimens from 46 stations. Bell-shaped umbrella, as high as broad; up to 11 mm in diameter. Exumbrella smooth. Mesoglea thickened dorsally. Velum broad. Four peronia, alternating deep and shallow. Two opposite tentacles arising from within mesoglea near apex, solid, long and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Eight quadrangular gastric pouches, situated below level of tentacles. Peripheral canal absent. Up to 32 statocysts, otoporpae absent. Gonads associated with gastric pouches.

Material examined: H4981, H4982.

Comments: This is the only species in this genus.

Distribution: Cosmopolitan. Previously recorded around the Chagos Archipelago (Browne 1916) and Mozambique (Bouillon 1978*b*). Eurybathic.

Family Cuninidae Bigelow, 1913

Cunina globosa Eschscholtz, 1829

Cunina globosa: Eschscholtz 1829: 117, pl. 9, figs 3a–c; Kramp 1961: 281; 1968: 129, fig. 350.

Description: 11 immature specimens from six stations. Hemispherical umbrella, slightly broader than tall, up to 8 mm in diameter. Exumbrella surface smooth. Mesoglea thickened. Velum broad. 12 equally-well developed peronia; 12 marginal lappets short, square. 12 tentacles arising from within mesoglea, at centre of each gastric pouch, short, solid and characteristically banded. Without secondary tentacles on umbrella margin (but see Pagès *et al*. 1992, fig. 45). Mouth simple, circular. 12 wide quadrangular gastric pouches, not extending beyond level of tentacles ventrad. Peripheral canal present. **Three statocysts per marginal lappet**; **otoporpae present**, **short**, **oval**. When mature, gonads associated with gastric pouches.

Material examined: H4983.

Comments: The ten recognised and named species of the genus *Cunina* (Bouillon & Boero 2000*b*) can be separated by a combination of features including overall body shape, the presence/absence and size of peripheral canals, the number and shape of the gastric pouches, the number of statocysts per marginal lappet, and the number, size and shape of the otoporpae. Some species may also possess ectodermal pads at the base of tentacles. Aside from *C. peregrina* H.B. Bigelow, 1909 (below), three other species of *Cunina* have been collected in the west Indian Ocean (see Kramp 1957): *C. duplicata* Maas, 1893 (minute otoporpae; up to 29, well separated tongue-shaped gastric pouches; transverse portion of peripheral canal narrower than lateral portion); *C. frugifera* Kramp, 1948 (linear otoporpae; between 6–9 well separated triangular stomach pouches; peripheral canal uniformly broad); and *C. octonaria* McCrady, 1857 (otoporpae small; 7–9 close-set rectangular stomach pouches; peripheral canal absent).

Distribution: World-wide but scattered in tropical and temperate waters. Previously caught near the Cape of Good Hope (Kramp 1957). This is the first record from the west Indian Ocean. Epipelagic.

Cunina peregrina H.B. Bigelow, 1909

Cunina peregrina: H.B. Bigelow 1909: 59, pl.1, fig. 6, pl.15, figs 1, 2, pl. 28, figs 1, 7, pl. 45, fig. 8; Kramp 1961: 283; 1968: 129, fig. 348.

Description: Three specimens from two stations. Hemispherical umbrella, slightly broader than tall, up to 9 mm in diameter. Exumbrella surface smooth. Mesoglea thickened dorsally. Velum broad. 12 equally-well developed peronia; 12 broad marginal lappets, short, square. 12 tentacles arising from within mesoglea, at centre of each gastric pouch, short, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. 12 quadrangular gastric pouches, not extending beyond level of tentacles ventrad. Peripheral canal absent. **4–10 statocysts per marginal lappet**; **otoporpae present**, **narrow**, **linear**. Gonads associated with gastric pouches.

Material examined: H4984.

Comments: see *C. globosa*.

Distribution: World-wide in tropical and subtropical waters. Previously collected around the Seychelles (Bouillon 1978*b*) and off south-east Africa and in the Mozambique Channel (Kramp 1957*a*). Epipelagic.

Solmissus marshalli Agassiz & Mayer, 1902

Solmissus marshalli: Agassiz and Mayer 1902: 151, pl. 5, figs 5, 23; Kramp 1961: 286; 1968: 131, fig. 354.

Description: Seven immature specimens from six stations. **Saucer-shaped umbrella**, broader than tall, up to 16 mm in diameter. **Exumbrella surface smooth**. **Mesoglea thickened** centrally, thinning to lappets. Velum broad. 8–20 equally-well developed peronia, short; similar number of broad, marginal lappets, very short, square, indistinct. 8–20 tentacles arising from within mesoglea, at centre of each gastric pouch, long, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. **8–20 quadrangular gastric pouches**, not extending beyond level of tentacles ventrad. Peripheral canal absent. More than ten statocysts per marginal lappet, without otoporpae. When mature, gonads associated with gastric pouches.

Material examined: H4985, H4986.

Comments: The four recognised and named species (Bouillon & Boero 2000*b*) can be separated on a combination of characters, including the number and shape of stomach pouches, the texture of the exumbrella surface and the mesoglea, as well as the overall body shape. Only one other species, *S. incisa* (Fewkes, 1886) has been recovered in Indian Ocean, off Sri Lanka (Kramp 1965), and this is identifiable by its greater number of stomach pouches (20–40) and their oval shape, as well as by the reduced number of statocysts per marginal lappet (2–5).

Distribution: World-wide in tropical and subtropical waters. Previously collected off south-east Africa and near the Cape of Good Hope (Kramp 1957). Epi- and mesopelagic.

Family Solmarisidae Haeckel, 1879

Pegantha rubiginosa (Kölliker, 1853)

Eurystoma rubiginosum: Kölliker 1853: 322.
Pegantha rubiginosa: Kramp 1961: 276; 1968: 127, fig. 343.

Description: Single adult specimen. Hemispherical umbrella, slightly broader than tall, 12.6 mm in diameter. **Exumbrella surface smooth**. Mesoglea thickened centrally, thinning to lappets. Velum broad. 14 equally-well developed peronia, shallow; 14 marginal lappets, deep, square. 14 tentacles arising from within mesoglea, at periphery of manubrium, long, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Manubrium without gastric pouches. **Peripheral canal** present, **narrow throughout**. **4–6 statocysts** per marginal lappet; **otoporpae** present, **thin**, **longer than width of peripheral canal**, **central ones markedly longer than laterals**. Gonads simple, smooth, forming diverticula of margin of oral wall on manubrium.

Material examined: H4987.

Comments: Although Bouillon and Boero (2000*b*) have listed some 22 putative species of *Pegantha*, they only recognise six of these to be valid. These can be separated by a combination of the following characters: overall body-shape, the texture of the exumbrella surface, the number and shape of otoporpae and marginal lappets, as well as by the relative diameter of the peripheral canal throughout its length. Aside from the other species described here (see below), one other species has been recovered from the west Indian Ocean (see references in Kramp 1961): *P. triloba* Haeckel, 1879 (exumbrella with radiating furrows and ridges; 12–16 slightly pointed marginal lappets, each with up to 20 statocysts; otoporpae of longer than width of peripheral canal).

Distribution: Mediterranean Sea and Atlantic Ocean. This is the first record from the west Indian Ocean. Mainly epipelagic.

Pegantha laevis H.B. Bigelow, 1909

Pegantha laevis: H.B. Bigelow 1909: 97, pl. 16, fig. 1, pl. 20, figs 4–6, pl. 27, figs 1–7; Kramp 1961: 273; 1968: 126, fig. 341.

Description: Two immature specimens from two stations. Flat, saucer-shaped umbrella, broader than tall, up to 2.3 mm in diameter. **Exumbrella surface smooth**. Mesoglea thickened centrally, thinning to lappets. Velum broad. With up to 12 equally-well developed peronia, shallow; a similar number of marginal lappets, deep, square. 10–12 (normally 16–26 in adult specimens) tentacles arising from within mesoglea, at periphery of manubrium, long, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Manubrium without gastric pouches. Peripheral canal present, **broad throughout**. **5–7 statocysts** per marginal lappet; with **otoporpae**, **thin**, **shorter than width of peripheral canal**. When mature, typically forming diverticula of margin of oral wall on manubrium; sac-shaped, with papilliform processes.

Material examined: H4988.

Comments: see *P. rubiginosa*.

Distribution: Cosmopolitan. Has been collected previously along west coast of South Africa and off East Africa (Kramp 1957). Epipelagic.

Pegantha martagon Haeckel, 1879

Pegantha martagon: Haeckel 1879: 332; Kramp 1961: 274; 1968: 127, fig. 342.

Description: Two immature specimens from two stations. Hemispherical umbrella, slightly broader than tall; up to 6.3 mm in diameter. **Exumbrella surface smooth**. Mesoglea thickened centrally, thinning to lappets. Velum broad. Up to eight equally-well developed peronia, shallow; eight marginal lappets, deep, square. With eight tentacles (though typically with 10–18 when adult) arising from within mesoglea, at periphery of manubrium, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Manubrium without gastric pouches. **Peripheral canal** present, **lateral portion broad at base and tapering outwards**. **4–6 statocysts** per marginal lappet; **otoporpae** present, **narrow**, **slightly longer than width of peripheral canal**. When mature, typically forming simple, sac-like diverticula of margin of oral wall on manubrium.

Material examined: H4989.

Comments: see *P. rubiginosa*.

Distribution: Cosmopolitan. Previously caught along the south-east coast of Africa (Kramp 1957*a*). Mainly epipelagic.

Pegantha clara R.P. Bigelow, 1909

Pegantha clara: R.P. Bigelow 1909: 80; Kramp 1961: 272; 1968: 126, figs 339, 340.

Description: Single immature, damaged specimen. Saucer-shaped umbrella, broader than tall; 4.8 mm in diameter. **Exumbrella surface smooth**. Mesoglea thickened centrally, thinning to lappets. Velum broad. With eight equally-well developed peronia, shallow; similar number of marginal lappets, deep, square. With eight tentacles (though typically with between 20–40 when adult) arising from within mesoglea, at periphery of manubrium, long, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Manubrium without gastric pouches. **Peripheral canal** present, **narrow throughout length**. **3–5 statocysts** per marginal lappet; **otoporpae** present, **long and thin**; **length almost equal to lappet depth**. When mature, typically forming slightly crenulated diverticula of margin of oral wall on manubrium.

Material examined: H4990.

Comments: see *P. rubiginosa*.

Distribution: Cosmopolitan. Previously caught off Madagascar (Vanhöffen 1912) and off East Africa (Kramp 1957). Mainly epipelagic.

Solmaris lenticula Haeckel, 1879

Solmaris lenticula: Haeckel 1879: 357; Kramp 1961: 278; 1968: 128.

Description: Single specimen. Umbrella as flattened lens, broader than tall, 2 mm in diameter. Exumbrella surface smooth. Mesoglea thickened centrally, thinning to lappets. Velum broad. With 16 equally-well developed peronia, shallow; **16 marginal lappets**, **deep**, **semi-circular**. 16 tentacles arising from within mesoglea, at periphery of manubrium, long, solid and characteristically banded. Without secondary tentacles on umbrella margin. Mouth simple, circular. Manubrium without gastric pouches. Peripheral canal absent. **Three statocysts per marginal lappet**; otoporpae absent. Gonads on manubrial wall, simple, annular.

Material examined: H4991.

Comments: Of the seven valid species of *Solmaris* considered by Bouillon and Boero (2000*b*), only *S. corona* (Keferstein and Ehlers, 1861) has previously been reported along the east coast of South Africa (Kramp 1957), though *S. rhodaloma* (Brandt, 1838) has been collected off the Seychelles (Bouillon 1978*b*). *S. corona* species can be distinguished from *S. lenticula* by its deep quadrangular lappets, which each bear two statocysts mounted on a large, bristle-bearing cushion, and by the greater number (36) of tentacles. Other features that can be used to separate species of *Solmaris* include the shape of the umbrella and the thickness of the mesoglea. *S. rhodoloma* is identifiable by the number of tentacles and (16–32), and by the number of statocysts per marginal lappet (1–2).

Distribution: Indian Ocean. This is the first record from the west Indian Ocean, though it has been recorded off the coast of India (Kramp 1965). Mainly epipelagic.

Subclass Trachymedusae Haeckel, 1879

Family Geryoniidae Eschscholtz, 1829

Geronyia proboscidalis (Forskål, 1775)

Medusa proboscidalis: Forskål 1775: 108, pl. 36, fig. 1.
Geronyia hexaphylla: Péron & Lesueur 1810: 329.
Geronyia proboscidalis: Eschscholtz 1829: 88; Kramp 1961: 237; 1968: 122, fig. 332.

Description: Four specimens from four stations. Hemispherical umbrella, broader than tall, up to 42 mm in diameter. Exumbrella surface smooth. Mesoglea thickish. Velum broad. Peripheral canal and six radial canals present; up to seven centripetal canals between radial canals. With six tentacles, each arising from umbrella margin opposite radial canal (perradial), long, hollow and characteristically banded. With six secondary tentacles on umbrella margin, short and solid. Mouth with six simple lips; on long (greater than depth of umbrella) conical gastric peduncle. Up to 12 statocysts present. Gonads broad and flat, heart-shaped, situated along radial canals.

Material examined: H4992.

Comments: This is the only species in this genus.

Distribution: World-wide in tropical and subtropical waters. Previously collected from the Chagos Archipelago (Browne 1916) and off the east coast of Africa (Kramp 1957). Mainly epipelagic.

Liriope tetraphylla (Chamisso & Eysenhardt, 1821)

Geryonia tetraphylla: Chamisso & Eysenhardt 1821: 357, pl. 27, fig. 2.
Liriope cerasiformis: Lesson 1843: 332.
Liriope tetraphylla: Gegenbaur 1857: 257; Kramp 1961: 238; 1968: 122, fig. 333.

Description: 822 specimens from 88 stations. Essentially hemispherical umbrella, flattened at apex, broader than tall; up to 20 mm in diameter. Exumbrella surface smooth. Mesoglea relatively thick. Velum broad. Peripheral canal and four radial canals present; up to four centripetal canals between radial canals. With four tentacles when mature, each arising from umbrella margin opposite radial canal (perradial), long(ish), hollow and characteristically banded. With four secondary tentacles on umbrella margin, short and solid. Mouth with four simple lips; on long (greater than depth of umbrella) conical gastric peduncle. Up to eight statocysts present. Gonads broad and flat, may be roundish and leaf-like, of irregular shape; situated along radial canals.

Material examined: H4993, H4994, H4995, H4996.

Comments: This is the only species in this genus.

Distribution: World-wide in temperate waters. Previously reported from the east coast of Africa (Kramp 1957) and the Chagos (Browne 1916) and Seychelles (Bouillon 1978*b*) archipelagos. Epipelagic.

Family Rhopalonematidae Russell, 1953

Aglaura hemistoma Péron & Lesueur, 1810

Aglaura hemistoma: Péron & Lesueur 1810: 351; Kramp 1961: 251; 1968: 121, fig. 331.

Description: 2455 specimens from 99 stations. Conical umbrella, flattened at apex, taller than broad; up to 4 mm in height. Exumbrella surface smooth. Mesoglea thin. Velum broad. Peripheral canal and eight radial canals present; no centripetal canals between radial canals. With up to 85 tentacles, each arising from umbrella margin, small, of equal length, hollow. Mouth with four simple lips; on slender, conical gastric peduncle, that is shorter than umbrella depth. Eight statocysts present. Eight gonads, sausage-shaped, hanging from gastric peduncle above level of stomach.

Material examined: H4997, H4998, H4999.

Comments: This is the only species in this genus.

Distribution: World-wide between 40°S and 40°N. Previously caught off the Chagos Archipelago (Browne 1916) and Mozambique (Bouillon 1978*b*). Epipelagic.

Persa incolorata McCrady, 1859

Persa incolorata: McCrady 1859: 206, pl. 12, fig. 3; Kramp 1961: 260; 1968: 119, fig. 323.

Description: Single specimen in poor condition. Bell-shaped umbrella with slight apical projection, taller than broad; 1.4 mm in height. Exumbrella surface smooth. Mesoglea thin. Velum broad. Peripheral canal and eight radial canals present; no centripetal canals between radial canals. With more than 20 tentacles, each arising from umbrella margin, long, of equal length, hollow, each bearing a small terminal knob. Mouth with four, prominent lips; on slender, gastric peduncle of variable length, but always shorter than umbrella depth. Eight statocysts present. Two sausage-shaped gonads, each hanging from subumbrella, approx. mid-way along opposite radial canals.

Material examined: H5000.

Comments: This is the only species in this genus.

Distribution: World-wide in tropical and warm temperate waters. This represents the first record from the west Indian Ocean. Eurybathic.

Rhopalonema velatum Gegenbaur, 1857

Rhopalonema velatum: Gegenbaur 1857: 251, pl. 9, figs 1, 5; Kramp 1961: 262; 1968: 115, fig. 307.

Description: 131 specimens from 57 stations. Bell-shaped umbrella, as tall as broad; up to 15 mm in height; **with a distinct round apical projection**. Exumbrella surface smooth. Mesoglea thickened at apex, thinning laterally. Velum broad. Peripheral canal and eight radial canals present; no centripetal canals between radial canals. Eight tentacles, each arising from umbrella margin opposite radial canal (perradial), long(ish), hollow and with a terminal swelling. Eight secondary tentacles at umbrella margin (one per octant), cirrus-like, short, stiff (frequently lost on preservation). Manubrium cylindrical, **elongated and reaching almost to level of velum**. Mouth with four simple lips, without gastric peduncle. Up to 16 statocysts present; situated at base of each tentacle and cirrus. Eight gonads, oval or linear in shape, each arising from subumbrella surface, attached for full length, **extending along middle 1/3 radial canal**.

Material examined: H5001, H5002, H5003.

Comments: The only other valid species in the genus, *R. funerarium* Vanhöffen, 1902, has also been caught in the tropical Indian Ocean (Kramp 1957). It can be separated from *R. velatum* by the absence of an apical projection, a shorter manubrium (not reaching to level of velum) and by the relative position of the gonads (along the distal 2/3 of the radial canals).

Distribution: World-wide in tropical and warm temperate waters. Previously caught off the Chagos Archipelago (Browne 1916) and Mozambique (Bouillon 1978*b*). Epipelagic.

Class Hydroidomedusa Claus, 1877 emended
Subclass Anthomedusae Haeckel, 1879
Family Bougainvillidae Lütken, 1850
Bougainvillia fulva Agassiz & Mayer, 1899

Bougainvillia fulva: Agassiz & Mayer 1899: 162, pl. 2, fig. 6; Kramp 1961: 77; 1968: 33, fig. 84.

Description: Nine specimens from 8 stations. Essentially cylindrical umbrella, slightly taller than broad, up to 13.5 mm high. Exumbrella surface smooth. Mesoglea thick, especially near apex. Peripheral canal and four radial canals present. Tentacles borne in four clusters, each cluster arising from **narrow**, **epaulette-shaped bulb** at umbrella margin opposite radial canal (perradial); **12–15 tentacles per cluster**, **short**, **solid and with a very slight terminal swelling**. Secondary tentacles absent. Manubrium wide, flat. Mouth simple, circular; without gastric peduncle; bearing four oral tentacles above mouth rim. **Oral tentacles dichotomously branched 8 times**; **small**, **with terminal cnidocyst clusters**. Without statocysts. **Ocelli black**, **minute**, **situated at base of each tentacle**. Eight oval distinct, adradial gonads, situated on manubrium.

Material examined: H5004, H5005, H5006.

Comments: Although only 23 species or so of medusae are considered valid by Bouillon and Boero (2000*b*), the number of described forms greatly exceeds this. Species can be separated with difficulty using a combination of features—the size and shape of tentacular bulbs, the number of tentacles per marginal bulb, and the number, size and colour of associated ocelli. The length and rigidity of marginal tentacles can also be useful in distinguishing species, as can the degree of branching and the point of first branching of the oral tentacles (and whether they are capitate or filiform). Aside from *B. muscoides* (see below) two other species of *Bougainvillia* medusae have been tentatively identified from the west Indian Ocean: *B. platygaster* (Haeckel, 1879) (Kramp 1957, 1965; Bouillon 1978*b*) and *B. muscus* (Allman, 1863) (Millard 1975; Bouillon 1978*b*). *B. platygaster* has triangular tentacular bulbs bearing 10–13 slightly capitate tentacles and four crescent-shaped ocelli; its small oral tentacles are capitate and dichotomously branched from the base, 4–5 times. *B. muscus* is globular and has small oval tentacular bulbs supporting 4–9 slightly capitate tentacles and minute black ocelli; its small oral tentacles are capitate and dichotomously branched above a distinct base, only twice. *B. macloviana* (Lesson, 1830) was collected by Bouillon (1978*b*) off the Seychelles archipelago.

Distribution: Widely distributed in tropical and subtropical waters of the Pacific and Indian Oceans. Previously caught off the Chagos (Browne 1916) and Seychelles archipelagos (Bouillon 1978*b*), and along the east coast of South Africa (Millard 1975). Neritic.

Bougainvillia muscoides (M. Sars, 1846)

Perigonimus muscoides M. Sars, 1846 (polyp).
Bougainvillia nordgaardi: Browne 1903: 14, pl. 2, fig. 1, pl. 3, figs 5, 6; Kramp 1961: 79.
Bougainvillia muscoides: Kramp 1968: 34, fig. 85.

Description: Single specimen. Essentially cylindrical, as tall as broad; 3.5 mm in height. Exumbrella surface smooth. Mesoglea relatively thin. Velum narrow. Peripheral canal and four radial canals present; no centripetal canals. Tentacles borne in four clusters, each cluster arising from small **triangular bulb** at umbrella margin opposite radial canal (perradial); **five tentacles** per cluster, short, solid and with a very slight terminal swelling. Secondary tentacles absent. Manubrium small, flat. Mouth simple, circular, with slight gastric peduncle; bearing four oral tentacles above mouth rim. **Oral tentacles with distinct base**, **dichotomously branched 4 times**; **small**, **with terminal cnidocyst clusters**. Without statocysts. **Without ocelli**. Eight distinct, adradial gonads, situated on manubrium; oval.

Material examined: H5007.

Comments: see *B. fulva*.

Distribution: Scattered records from boreal waters of Atlantic and Pacific Oceans; Gulf of Siam (Kramp 1965) and Arabian Gulf (Michel *et al.* 1986). Previously collected in the Arabian Gulf (Michel *et al.* 1986) and off Mozambique (Bouillon 1978*b*). Neritic.

Koellikerina fasciculata (Péron & Lesueur, 1810)

Melicerta fasciculata: Péron & Lesueur 1810: 353.
Koellikerina fasciculata: Kramp 1939: 511, 512; 1959*a*: 112, fig. 98; 1961: 85.

Description: Two specimens from one station; one mature damaged, the other immature. **Essentially cylindrical**, **globular umbrella**, as tall as broad, up to 7 mm in height. Exumbrella surface smooth. Mesoglea slightly thick. Velum broad. Peripheral canal and four radial canals present; no centripetal canals. Tentacles borne in eight clusters, each cluster arising from small, **kidney-shaped bulb** at umbrella margin; four perradial and four interradial; **up to 23 tentacles per cluster**; short, solid and with a very slight terminal swelling. Secondary tentacles absent. Manubrium short, broad, quadrangular. Mouth simple, circular, with pronounced, short gastric peduncle; bearing four oral tentacles above mouth rim. Oral tentacles with distinct base, dichotomously branched, up to seven times, small, with terminal cnidocyst clusters. Without statocysts. **Ocelli dark red**, **minute**, situated at base of each tentacle. Four distinct, perradial horseshoe-shaped, much folded gonads, situated on manubrium.

Material examined: H5010.

Comments: Of the eight valid species of *Koellikerina* considered by Bouillon and Boero (2000*b*), six are found in the Indian Ocean (Kramp 1961). These can be distinguished by their overall shape, the shape and size of the tentacle bulbs, and the number of tentacles and ocelli per bulb, as well as by the degree of branching and the point of first branching of the oral. Aside from *K. multicirrata* (below), the others have been reported from the coast of India (Menon 1932; Nair 1951; Kramp 1959*c*, 1965) or off Madagascar (Kramp 1965). These include *K. constricta* (Menon, 1932) (pyriform bell with marked constriction; eight marginal tentacles per cluster; ocelli red-brown in colour, minute), *K. elegans* (Mayer, 1900) (dome-shaped umbrella; 3–4 stiff and upward curving tentacles per cluster; dark brown ocelli), *K. maasi* (Browne, 1910) (dome-shaped bell; 5 unequally sized tentacles per cluster; no ocelli) and *K. ornata* Kramp, 1959*c* (conical umbrella; 11–13 tentacles per cluster; dark-red ocelli at tentacle base; two orange pigment spots per marginal bulb and single one at umbrella apex).

Distribution: Widespread but scattered in Mediterranean Sea and temperate waters of the Atlantic Ocean. There is some evidence to suggest that this species may be found in the waters of the north-west Pacific (http://www.china-fishery.net/fdis2003/latin_list.asp?initial_value=KO). This is the first record from the west Indian Ocean. Neritic.

Koellikerina multicirrata (Kramp, 1928)

Köllikeria multicirrata: Kramp 1928: 51, fig. 24.
Koellikerina multicirrata: Kramp 1961: 85.

Description: Single specimen. **Essentially cylindrical**, **globular umbrella**, as tall as broad; 7.3 mm in height. Exumbrella surface smooth. Mesoglea relatively thin. Velum broad. Peripheral canal and four radial canals present; no centripetal canals. Tentacles borne in eight clusters, each cluster arising from **linear bulb at umbrella margin**; four perradial and four interradial; **confluent**; **14 tentacles per cluster**; short, solid and with a very slight terminal swelling. Secondary tentacles absent. Manubrium short, broad, quadrangular. Mouth simple, circular, without gastric peduncle, bearing four oral tentacles above mouth rim. Oral tentacles with distinct base, dichotomously branched, up to seven times, small, with terminal cnidocyst clusters. Without statocysts. **Ocelli red-brown in colour**, **large**, eight, each situated in tentacle bulb. Eight distinct, adradial gonads, situated on manubrium, horseshoe or V-shaped, with three distinct lateral folds.

Material examined: H5011.

Comments: see *K. fasciculata*.

Distribution: Scattered records from tropical and subtropical waters of the Indian and Pacific oceans; fairly rare. Previously recorded along the east coast of South Africa (Millard 1975). Neritic.

Nubiella mitra Bouillon, 1980

Nubiella mitra: Bouillon 1980: 314, fig. 4; Goy *et al*. 1991: 109, fig. 22.

Description: Single immature specimen. Mitre-shaped umbrella, taller than broad; 1.5 mm in height. Exumbrella surface smooth. Mesoglea relatively firm, especially thick in apical cone. Velum narrow. Peripheral canal and four radial canals present; no centripetal canals. Four solitary marginal tentacles, each arising from small, almost spherical bulb at umbrella margin. Tentacles long, solid, filiform. Secondary tentacles absent. Manubrium flask-shaped, cylindrical, short, not reaching to level of velum. Mouth simple, circular, with short gastric peduncle; bearing four oral tentacles above mouth rim. Oral tentacles unbranched, small, with terminal cnidocyst clusters. Without statocysts. Without ocelli. When mature, gonads simple, smooth, completely surrounding manubrium proximally.

Material examined: H5012.

Comments: This is the only species in this genus.

Distribution: New Guinea and eastern Mediterranean Sea. First record from the west Indian Ocean.

Family Cytaeididae L. Agassiz, 1862

Cytaeis spp.

Cytaeis: Eschscholtz 1829: 104; Kramp 1961: 63; 1968: 26, fig. 64.

Description: 65 specimens from 27 stations. Bell-shaped umbrella, slightly broader than tall; up to 4 mm in diameter. Exumbrella surface smooth. Mesoglea tough. Velum narrow. Peripheral canal and four radial canals present; no centripetal canals. Four tentacles, each arising from pronounced pyriform bulb on umbrella surface opposite radial canal (perradial), stout, long(ish), solid. Secondary tentacles absent. Manubrium bulbous, pronounced. Mouth simple, circular, with short gastric peduncle; bearing 8–12 unbranched oral tentacles that arise at level of mouth rim. Oral tentacles small, with terminal cnidocyst clusters. Gonads interradial.

Material examined: H5013, H5014.

Comments: With the exception of *C. adherens* Bouillon, Boero and Seghers, 1991, all other species of *Cytaeis* medusae are considered indistinguishable (Bouillon & Boero 2000*b*). Given the meroplanktic nature of the genus, we should be cautious in interpreting any distribution of *Cytaeis* medusae as cosmopolitan, because crypsis is highly likely.

Distribution: Widespread in tropical and subtropical waters. Previously recovered from Mauritius (Vanhöffen 1911) and in the Mozambique Channel (Kramp 1965; Bouillon 1978*b*) as well as along the east coast of South Africa (Millard 1975). Neritic.

Family Hydractiniidae L. Agassiz, 1862

Hydractinia apicata (Kramp, 1959)

Podocoryne apicata: Kramp 1959*c*: 228, fig. 5; 1961: 67; 1968: 28, fig. 71.
Hydractinia apicata: Bouillon & Boero 2000*b*: 89.

Description: Single specimen. Essentially conical, bell-shaped umbrella, slightly taller than broad, **with slight apical projection**; 1.5 mm in height. Exumbrella surface smooth. Mesoglea thickish. Velum narrow. Peripheral canal and four narrow, unbranched radial canals present; **one centripetal canal in each quadrant**, **may reach to manubrium**; **without apical canal**. **Four tentacles** arising from umbrella margin at position of radial canals; **arising from pronounced swollen bulbs**, long, solid. Secondary tentacles absent. **Manubrium barrel-shaped**, extending to half bell depth. **Mouth simple**, **with four small but elongated lips**; with gastric peduncle of variable length. Four gonads, small, interradial, on manubrium, not extending along radial canals; without transverse folds.

Material examined: H5015.

Comments: Hydroids of the genus *Hydractinia* may reproduce by fixed sporosacs, eumedusoids or free medusae. This variability in the mode of reproduction is similarly reflected in the variability of medusoid morphology. 15 species of free medusae are recognised as valid by Bouillon and Boero (2000*b*), which can be separated by a combination of characters including; mouth and stomach shape, the degree of branching of the mouth ‘arms’, and the number and relative size/s of marginal tentacles and their bulbs. A number of other features are either present or absent, including, an apical process, a gastric peduncle and ocelli (colour and size also important diagnostic features). Only one other species, *H. carnea* (Sars, 1846), has been recovered from the west Indian Ocean (Bouillon 1978*b*) and this is characterised by the absence of an apical projection, a flask-shaped manubrium, 4–8 marginal tentacles, four capitate oral tentacles and no centripetal canals. A number of benthic polyps with fixed sporosacs are also recognised from the region (see e.g. Millard 1975).

Distribution: Tropical Indo-West Pacific. Previously collected by Bouillon (1978*b*) from around the Seychelles and in the Mozambique Channel. Neritic.

Family Pandeidae Haeckel, 1879

Amphinema australis (Mayer, 1900)

Stomotoca australis: Mayer 1900*b*: 32, pl. 1, fig. 2.
Amphinema australis: Kramp 1961: 92; 1968: 42, fig. 107.

Description: Two specimens from two stations. Essentially bell-shaped umbrella, as broad as tall but with pronounced, solid apical projection; up to 3.3 mm in height. Exumbrella surface smooth. Mesoglea thickened apically. Velum broad. Peripheral canal and four broad radial canals present; no centripetal canals or mesenteries. Two opposite perradial tentacles arising from umbrella margin, long, hollow. Secondary tentacles absent but **4–5 marginal warts present**, **1–2 per quadrant**. **Manubrium urn-shaped**, extending to half bell depth. Mouth simple, with four prominent, recurved lips; without gastric peduncle. **With orange-red ocelli at base of tentacles and warts**. Gonads interradial, folded, not extending along radial canals.

Material examined: H5017.

Comments: Ten recognised species (Bouillon & Boero 2000*b*), of which three have been described previously from this region (Kramp 1961). Species can generally be distinguished by the number of secondary tentacles or marginal warts and the shape of the manubrium, as well as by the presence, and colour, of ocelli. The distribution of the gonads can also be important. The species that is not described here, but which has been recovered from the west Indian Ocean previously (Bouillon 1978*b*) is *A. dinema* (Péron & Lesueur, 1810), and it can readily distinguished by the fact that it has 14–24 marginal warts (3–6 per quadrant), a flask-shaped manubrium that is cruciform in section, and lacks ocelli. *A. rugosum* (Mayer, 1900) has been collected off the Seychelles (Bouillon 1978*b*).

Distribution: Widely distributed in tropical and subtropical waters of the Atlantic and Pacific oceans. This is the first record from the west Indian Ocean. Neritic.

Amphinema turrida (Mayer, 1900)

Dissonema turrida: Mayer 1900*b*: 44, pl. 2, figs 3, 4.
Amphinema turrida: H.B. Bigelow 1909: 200, pl. 7, fig. 2, pl. 40, fig. 6, pl. 43, fig. 3, pl. 44, figs 3, 4; Kramp 1961: 95; 1968: 42, fig. 106; Bouillon 1980: 323, fig. 8.

Description: Three specimens from three stations. Essentially bell-shaped umbrella, taller than broad and with pronounced, hollow apical projection; up to 4 mm in height. Exumbrella surface smooth. Mesoglea thickened apically. Velum broad. Peripheral canal and four broad radial canals present; no centripetal canals or mesenteries. Two opposite perradial tentacles arising from elongated **conical bulbs** on umbrella margin, long, hollow. **Tentaculae absent** (as H.B. Bigelow 1909), **but with up to three marginal warts per quadrant**. **Manubrium pyriform**, almost as long as bell cavity. Mouth simple, with four prominent, crenulated, recurved lips; without gastric peduncle. **With red ocelli at base of tentacles and tentaculae**. Gonads sac-like, adradial, extending from stomach wall along radial canals; extensively folded.

Material examined: H5018, H5066.

Comments: see *A. australis*.

Distribution: World-wide in tropical and temperate waters, including the Mediterranean Sea. This is the first record from the west Indian Ocean. Neritic.

Annatiara affinis (Hartlaub, 1914)

Tiaranna affinis: Hartlaub 1914: 269, figs 220, 221.
Annatiara affinis: Russell 1953: 200–203, figs 101, 102; Kramp 1961: 96; 1968: 48, fig. 125.

Description: Two specimens from two stations. Bell-shaped umbrella, as broad as tall, without apical projection, up to 1.4 mm in height. Exumbrella surface smooth but with many cnidocyst tracks. Mesoglea thick. Velum broad. Peripheral canal and four broad radial canals present; no centripetal canals or mesenteries. Up to 36 tentacles, arising from laterally compressed bulbs on umbrella margin, large, hollow; each alternating regularly with smaller tentacle. Manubrium short, very broad, cross-shaped in section; with four enlarged perradial lobes closely connected to radial canals proximally. Mouth broad, simple, with four prominent, crenulated lips; without gastric peduncle. With minute ocelli at base of all tentacles. Gonads interradial, irregularly folded, on stomach walls and extending along sides of perradial manubrial lobes.

Material examined: H5019.

Comments: This is the only species in this genus.

Distribution: Widespread in tropical and temperate waters, rare. This is the first record from the west Indian Ocean. Bathypelagic.

Leuckartiara gardinieri Browne, 1916

Leuckartiara gardinieri: Browne 1916: 181, pl. 39, fig. 4; Kramp 1961: 103; 1968: 46, fig. 119; Bouillon 1980: 331, fig. 13.

Description: Eight specimens from five stations. Conical umbrella, taller than broad, with pronounced apical projection; up to 7 mm in height. **Exumbrella surface smooth**, **with four perradial**, **longitudinal bands extending from tentacular bulbs towards apex**. Mesoglea thickened apically, thin laterally. Velum broad. Peripheral canal conspicuous, four broad radial canals present, no centripetal canals. Four perradial marginal tentacles arising from laterally compressed bulbs on umbrella margin, long, hollow, bearing characteristic bands. **12–20 secondary tentaculae present**, **minute**, **solid**; **3–5 regularly alternating with larger tentacles**. Manubrium enlarged, occupying almost entire subumbrella cavity; flask-shaped, with broad base, connected to radial canals by mesenteries. Mouth wide, with much crenulated lips; without gastric peduncle. **With ocelli at base of tentacles and tentaculae**. Gonads horseshoe shaped, bipartite, on manubrium, interradial, with extensive transverse folds directed perradially, connected by transverse bridge adradially.

Material examined: H5020.

Comments: 14 named species of *Leuckartiara* are considered valid by Bouillon and Boero (2000*b*). Aside from the two species described here, *L. annexa* Kramp, 1957 has been described from off the east coast of Africa (Kramp 1957) and *L. zacae* Bigelow, 1940 has been recovered in the Mozambique Channel (Kramp 1965). The former species is identifiable by the absence of an apical projection, the presence of eight large tentacles that each arise from an elongated bulb bearing a abaxial spur, and by the possession of eight secondary tentaculae (and 16 marginal warts). The exumbrella of *L. zacae* bears a series of longitudinal ribs, and although four large tentacles are usually observed, there are also between 8–12 smaller tentacles and up to 48 marginal warts. Pagès *et al.* (1992) tabulate the differences between species clearly.

Distribution: Tropical and warm temperate waters of Indian and Pacific oceans. Previously recorded off south-east Africa and Madagascar (Browne 1916), and along the east coast of South Africa (Millard 1975). Neritic.

Leuckartiara octona (Fleming, 1823)

Geryonia octona: Fleming 1823: 299.
Leuckartiara octona: Russell 1953: 188–195, figs 91–96; Kramp 1961: 105; 1968: 47, fig. 121.

Description: 43 specimens from 21 stations. Bell-shaped umbrella, taller than broad and with pronounced, hollow apical projection, up to 12 mm in height. **Exumbrella surface smooth**. Mesoglea thickened apically, thin laterally. Velum broad. Peripheral canal conspicuous; four broad radial canals present, with irregular margin; no centripetal canals. **12 marginal tentacles arising from laterally compressed bulbs on umbrella margin**; **bulbs with abaxial spur**. Tentacles long, hollow. **12–24 secondary tentaculae present**, **short**, **solid**; **1–3 regularly alternating with larger tentacles**. Manubrium enlarged, occupying much of subumbrella cavity, flask-shaped, with broad base, connected to radial canals by mesenteries. Mouth with much crenulated lips; without gastric peduncle. **With ocelli at base of tentacles and tentaculae**. Gonads horseshoe shaped, bipartite, on manubrium, interradial, with extensive transverse folds directed perradially.

Material examined: H5021, H5022.

Comments: see *L. gardinieri*.

Distribution: World-wide in tropical and temperate waters. Previously collected around the Seychelles (Bouillon 1978*b*) and along the east coast of South Africa (Millard 1975). Neritic.

Pandeopsis ikarii (Uchida, 1927)

Tiaranna ikarii: Uchida 1927: 208, fig. 35.
Pandeopsis scutigera: Kramp 1959*c*: 232, fig. 7; 1961: 113, 444.
Pandeopsis ikarii: Kramp 1968: 41, fig. 105.

Description: Single immature specimen. Bell-shaped umbrella, slightly taller than broad, without apical projection; 1.7 mm in height. Exumbrella surface smooth. Mesoglea thick. Velum broad. Peripheral canal conspicuous; four broad radial canals present, with smooth margin; no centripetal canals. With four marginal tentacles (mature specimens typically have up to 16) arising from conspicuous, conically swollen bulbs on umbrella margin; bulbs without abaxial spur. Tentacles long, hollow. 8–24 small rudimentary bulbs present, no tentaculae; 1–2 alternating with larger tentacles. Manubrium quadrangular, short (less than half depth of bell cavity), broad, attached to subumbrella in proximal region, connected to radial canals by long mesenteries. Mouth simple, with four lips; without gastric peduncle. Without statocysts. With ocelli in all tentacular and rudimentary bulbs on umbrella margin. Four sheet-like, smooth gonads covering interradial surface of manubrium (apparently each with 3–4 reddish spots).

Material examined: H5023.

Comments: This is the only species in this genus.

Distribution: Widespread in tropical and warm temperate waters of Indo-west Pacific. This is the first record from the west Indian Ocean. Bathypelagic.

Family Proboscidactylidae Hand & Hendrickson, 1950

Proboscidactyla ornata (McCrady, 1859)

Willsia ornata: McCrady 1859: 149, pl. 9, figs 9–11.
Proboscidactyla ornata: Kramp 1961: 235; 1968: 109, fig. 290.

Description: Two specimens from two stations. Hemispherical, dome-shaped umbrella, slightly taller than broad; up to 3.7 mm in diameter. Exumbrella surface smooth. Mesoglea thick. Velum broad. Peripheral canal absent; **four narrow radial canals present**, **with smooth margin**, **each bifurcating twice** (to produce 16 terminal radial canals); no centripetal canals. As many marginal tentacles as terminal radial canals, each arising from small swollen bulb on umbrella margin, bulbs without abaxial spur. Tentacles relatively long, hollow. Without secondary tentaculae. Cnidocyst clusters **(cnidacthylacy) from exumbrella margin between each marginal tentacle**. Manubrium short, **with four gastric lobes** that extend short distance along radial canals proximally. **Mouth with four recurved and crenulated lips**; without gastric peduncle. Without statocysts. Without ocelli. Gonads surround manubrium and extend over gastric lobes.

Material examined: H5024, H5025.

Comments: Although the family Proboscidactylidae has traditionally been considered to belong to Limnomedusae, we have followed Bouillon and Boero (2000*b*) and included it with Anthomedusae. Of the seven named species considered to be valid by Bouillon and Boero (2000*b*), only the two described here are currently known from the region. Species of *Proboscidactyla* can be differentiated on the number and degree of branching, of radial canals (which is reflected in the number of tentacles, the number of mouth lips and the number of gastric pouches) and the arrangment of cnidacthylacies.

Distribution: World-wide in tropical and warm temperate waters. Previously recorded from East Africa (Kramp 1965) and in the Mozambique Channel (Bouillon 1978*b*). Neritic.

Proboscidactyla stellata (Forbes, 1846)

Willsia stellata: Forbes 1846: 268.
Proboscidactyla stellata: Kramp 1961: 236; 1968: 109, fig. 294; Pagès *et al*. 1992: 37, fig. 41.

Description: Eight specimens from one station. Hemispherical, dome-shaped umbrella, broader than tall; up to 3.3 mm in diameter. Exumbrella surface smooth. Mesoglea thick. Velum broad. **Peripheral canal absent**; **six narrow radial canals present**, **with smooth margin**, **each bifurcating twice** (to produce 24 terminal radial canals); no centripetal canals. As many marginal tentacles as terminal radial canals, each arising from small swollen bulb on umbrella margin, bulbs without abaxial spur. Tentacles relatively long, hollow. Without secondary tentaculae. Cnidocyst clusters **(cnidacthylacy) from exumbrella margin at base of**, **and between**, **each marginal tentacle**. Manubrium hexagonal, short, **with six gastric lobes that extend along radial canals proximally**. Mouth short, with **six crenulated lips**; without gastric peduncle. Without statocysts. Without ocelli. Gonads surrounding manubrium, extend over the six gastric lobes.

Material examined: H5026.

Comments: see *P. ornata*.

Distribution: Widespread in Atlantic and Pacific Oceans. This is the first record from the west Indian Ocean. Neritic.

Family Zancleopsidae Bouillon, 1978
Zancleopsis gotoi (Uchida, 1927)

Cnidotiara gotoi: Uchida 1927: 204, fig. 33; Kramp 1961: 98.
Zancleopsis gotoi: Kramp 1968: 39, fig. 99.

Description: Single specimen. Bell-shaped umbrella, slightly taller than broad, **with pronounced**, **solid apical projection**; 5 mm in height. Exumbrella surface smooth. Mesoglea thick and rigid. Velum broad. Peripheral canal conspicuous; four relatively broad radial canals present, with smooth margin; no centripetal canals. With four perradial marginal tentacles, each arising from a conspicuous basal bulb at umbrella margin, bulbs swollen adaxially. **Tentacles hollow**, **capitate**, **unbranched**, **alternating short and very short**. Manubrium with broad based, flask-shaped, reaching to less than half depth of bell cavity; not connected to radial canals by mesenteries. **Mouth simple**, **cruciform**, **without lips**; without gastric peduncle. Without statocysts. **With ocelli on bulb of marginal tentacles**. Four smooth gonads; interradial, divided into eight adradial masses.

Material examined: H5027.

Comments: Of the five species that are considered to be valid by Bouillon and Boero (2000*b*), only this has previously been recorded from the region. Species can generally be separated by the relative lengths, and their degree of branching, of the marginal tentacles, and the presence/absence of an apical projection. Ocelli may vary in distribution and number.

Distribution: Tropical and subtropical waters of the Indo-West Pacific, rare. Previously reported from west of Madagascar (Kramp 1965). Neritic.

Family Corymorphidae Allman, 1872
Euphysora abaxialis Kramp, 1962

Euphysora abaxialis: Kramp 1962: 309, figs 2–4; 1968: 15, fig. 29.

Description: Three small and damaged specimens from three samples. Dome-shaped umbrella with rounded apex, taller than broad, **without apical projection**; up to 1.4 mm in height. Exumbrella surface smooth, with patch of small papillae at apex. Mesoglea slightly thick. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal **nor apical canals**. **With four perradial marginal tentacle bulbs arising from umbrella margin**; **with only one tentacle**, **arising from enlarged basal bulb**. **Tentacle hollow**, **long**, **unbranched**, **without terminal knob but with cnidocyst clusters swollen**, **distributed in single row abaxially**. Manubrium globular, filling almost entire bell cavity; not extending beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; without gastric peduncle. Without ocelli on bulb of marginal tentacles. Without cnidocyst tracks on exumbrella. Gonads entirely encircling the manubrium, smooth.

Material examined: H5031.

Comments: Twelve species are considered valid by Bouillon and Boero (2000*b*). Aside from the three species described here, two others (Kramp 1961) have been recovered in the west Indian Ocean: *E. furcata* Kramp, 1948 has been recorded off East Africa (Kramp 1957) and *E. normani* (Browne, 1916) has been found off Chagos (Browne 1916). The former of these species is characterised by having a twice-bifurcated tentacle opposite another fairly long tentacle; the latter species has a high, conical apical projection and three lateral, and one large terminal, cnidocyst clusters on the single long tentacle.

Distribution: Tropical and subtropical waters the Indo-West Pacific. This is the first record from the west Indian Ocean. Neritic.

Euphysora annulata Kramp, 1928

Euphysora annulata: Kramp 1928: 39, fig. 13; 1961: 39; 1968: 15, fig. 27.

Description: Single immature specimen. Barrel-shaped umbrella, slightly taller than broad, **with pointed apical projection**; 1.4 mm in diameter. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; without centripetal canals; **apical canal present**. **With four perradial marginal tentacle bulbs arising from umbrella margin**; **conical**, **conspicuous**. **With one long tentacle**, **hollow**, **unbranched**, **bearing terminal knob and with swollen cnidocyst clusters in form of rings**; **irregularly distributed**. **With three short tentacles**, **that opposite main tentacle being longer than others**; **hollow**, **filiform**, **without conspicuous cnidocyst clusters**. Manubrium globular, filling almost entire bell cavity, may extend beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; without gastric peduncle. Without ocelli on bulb of marginal tentacles. Without cnidocyst tracks on exumbrella. When mature, smooth gonads entirely encircling manubrium.

Material examined: H5032.

Comments: see *E. abaxialis*.

Distribution: Scattered records from tropical waters of the Indian and Pacific oceans. This is the first record from the west Indian Ocean. Neritic.

Euphysora bigelowi Maas, 1905

Steenstrupia bigelowi: Mayer 1910: 36, fig. 9.
Euphysora bigelowi: Maas 1905: 7, pl. 1, figs 1–3; Kramp 1961: 39; 1968: 15, fig. 26.

Description: Single immature specimen. Bell-shaped umbrella, taller than broad, **with pointed apical projection**; 2 mm in height. Exumbrella surface smooth, with patch of small papillae at apex. Mesoglea thin. Velum relatively broad. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor **apical canals**. **With four perradial marginal tentacle bulbs arising from umbrella margin**; **conical**, **conspicuous**. **With one long tentacle**, **hollow**, **unbranched**, **bearing terminal knob and three swollen cnidocyst clusters in single row along adaxial surface**. **With three short tentacles**, **pointed and filiform**, **hollow**, **without conspicuous cnidocyst clusters**. Manubrium globular, filling almost entire bell cavity, not extending beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; without gastric peduncle. Without ocelli on bulb of marginal tentacles. Without cnidocyst tracks on exumbrella. When mature, smooth gonads entirely encircling manubrium.

Material examined: H5033.

Comments: see *E. abaxialis*.

Distribution: Widespread in tropical and subtropical waters of the Indian-West Pacific. Previously recorded from Mauritius (Browne 1916) and the Mozambique Channel (Kramp 1965). Neritic.

Vannuccia forbesii (Mayer, 1894)

Hybocodon forbesi: Mayer 1894: 236, pl. 1, fig. 1; Kramp 1961: 42; 1968: 13, fig. 22.
Vannuccia forbesii: Brinkmann-Voss 1967: 263.

Description: Seven immature specimens from six stations. Ellipsoidal umbrella, slightly taller than broad, without apical projection; up to 2.3 mm in height. Umbrella margin slightly oblique. Exumbrella surface smooth; without cnidocyst tracks. Mesoglea thin. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor apical canals. With four perradial marginal bulbs, small and rudimentary. Single tentacle, long, stout, hollow proximally, unbranched, with large terminal cnidocyst swelling. Manubrium swollen, spindle-shaped, occasionally extending beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; on short gastric peduncle. Without statocysts. Without ocelli on bulb of marginal tentacles. When mature, simple gonads entirely encircling manubrium for much of length.

Material examined: H5034, H5035.

Comments: One of two recognised species (Bouillon & Boero 2000*b*); the other being restricted to the east tropical Pacific Ocean (Vargas-Hernandez & Ochoa-Figuera 1991).

Distribution: World-wide in tropical and warm temperate waters. Previously recorded from around the Seychelles and in the Mozambique Channel (Bouillon 1978*b*). Neritic.

Paragotoea bathybia Kramp, 1942

Paragotoea bathybia: Kramp 1942: 26, figs 7a–c; 1959*a*: 90, fig. 43; 1961: 44; Pagès & Bouillon 1997: 487–493.

Description: Five specimens from five samples. Bell-shaped umbrella with flattened apex, slightly taller than broad, without apical projection; up to 1.4 mm in height. Exumbrella surface smooth, with numerous scattered cnidocysts. Mesoglea uniformly thick. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor apical canals. With four large perradial marginal bulbs. Single long, stout, proximally hollow, unbranched tentacle, with large terminal cnidocyst swelling. Manubrium essentially cylindrical, swollen, not reaching velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; on short gastric peduncle. Without statocysts. Without ocelli on bulb of marginal tentacles. Gonads simple, interradial, entirely encircling the manubrium distally.

Material examined: H5036, H5037, H5038.

Comments: This is the only species in this genus.

Distribution: Scattered but widespread in Atlantic Ocean. This is the first record from the west Indian Ocean. Epi- and mesopelagic.

Family Euphysidae Haeckel, 1879

Cnidocodon leopoldi Bouillon, 1978

Cnidocodon leopoldi: Bouillon, 1978*a*: 255, fig. 4.

Description: Three specimens from three stations. Rounded umbrella, slightly taller than broad, without apical projection; up to 1.3 mm in height. Exumbrella surface smooth, without cnidocyst tracks, but with scattered cnidocysts. Mesoglea thick. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; without centripetal or apical canals. With four perradial marginal tentacles arising from conspicuous bulbs on umbrella margin; marginal bulbs swollen adaxially. Tentacles similar, of equal length, short, stout, hollow, divided into 3–5 short capitate branches. Manubrium as inverted gourd, with broad circular base, not extending beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, may be cylindrical, without lips; without gastric peduncle. Without ocelli on bulb of marginal tentacles. Gonads entirely encircling manubrium, though most oral part free, smooth.

Material examined: H5039.

Comments: This is the only species in this genus.

Distribution: New Guinea. This is the first record from the west Indian Ocean. Neritic.

Euphysilla pyramidata Kramp, 1955

Euphysilla pyramidata: Kramp 1955: 245, pl. 1, fig.1, pl. 2, fig. 3; 1961: 39; 1968: 17, fig. 33.

Description: Single immature specimen. Bell-shaped umbrella, slightly taller than broad, without apical projection; 2.2 mm in height. Exumbrella surface smooth. Mesoglea thick. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; without centripetal canals. With four perradial marginal tentacles arising from bulbs on umbrella margin. Tentacles short, stout, hollow, unbranched, bearing terminal knob and swollen cnidocyst clusters in single row along adaxial surface. Manubrium pyramidal, with broad quadrangular base, not extending beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; without gastric peduncle. Without ocelli on bulb of marginal tentacles. Without cnidocyst tracks on exumbrella. When mature, smooth gonads entirely encircling manubrium.

Material examined: H5040.

Comments: Of the two species considered to be valid by Bouillon & Boero (2000*b*), only one is recognised from the Indian Ocean. The other species, *E. peterseni* Allwein, 1967 was described off the Atlantic coast of North America.

Distribution: Scattered records from West Africa and from around the Seychelles (Bouillon 1978*b*) and in the Mozambique Channel (Kramp 1955). Neritic.

Euphysa tetrabrachia Bigelow, 1904

Euphysa tetrabrachia: Bigelow 1904: 251, pl. 1, fig. 1; Kramp 1961: 38; 1968: 10, fig. 15.

Description: Three immature specimens from three stations. Bell-shaped umbrella, taller than broad, with blunt apical projection; up to 4 mm in height. Exumbrella surface smooth. Mesoglea thick at apex, thinning laterally. Velum broad. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor apical canals. With four perradial marginal tentacle bulbs arising from umbrella margin, small. With one long tentacle, hollow, unbranched, filiform but **bearing swollen cnidocyst clusters as warts irregularly along tentacle length**. **With three short filiform tentacles**, **bearing swollen cnidocyst clusters as warts irregularly along tentacle length**. **Manubrium spindle-shaped**, **as long as bell cavity is deep**, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; without gastric peduncle. Without ocelli on bulb of marginal tentacles. Without cnidocyst tracks on exumbrella. When mature, simple but folded gonads entirely encircling manubrium in central region only.

Material examined: H5041, H5042.

Comments: With the exception of *E. aurata* (Forbes, 1848), which was recorded by Bouillon (1978*b*) off the Seychelles, none of the other eight valid named species recognised by Bouillon and Boero (2000*b*) have been recorded from the west Indian Ocean. Species can be differentiated by the number, relative length and distribution of cnidocysts on the tentacles, as well as by the shape and relative length of the manubrium. *E. aurata* is identifiable by its single tentacle, which bears rings of cnidocysts along its length.

Distribution: Scattered in tropical waters of Indian Ocean. This is the first record from the west Indian Ocean. Neritic.

Family Tubulariidae Fleming, 1828

Hybocodon unicus (Browne, 1902)

Amphicodon unicus: Browne 1902: 276.
Hybocodon unicus: Kramp 1961: 44; 1968: 13, fig. 20.

Description: Two specimens from two stations. Bell-shaped umbrella, taller than broad, with indistinct apical projection; up to 2 mm in height. Umbrella margin slightly oblique. **Exumbrella surface smooth**, **with irregularly scattered cnidocyst tracks**. Mesoglea thinning laterally. Velum broad. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor apical canals. **With four perradial marginal bulbs**; **three minute and rudimentary**, **fourth surrounded by cnidocyst swellings**; latter bulb forming base of single tentacle. **Tentacle long**, **typically coiled**, **hollow**, **unbranched**, **filiform**. **Manubrium cylindrical**, **not extending beyond velum**, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; on short gastric peduncle. Without ocelli on bulb of marginal tentacles. Gonads simple, entirely encircling manubrium for much of length.

Material examined: H5043, H5044.

Comments: Five free-living medusae are recognised as valid by Bouillon and Boero (2000*b*), though aside from the present material, none are known from the west Indian Ocean. Species can be separated on the distribution and number of cnidocyst tracks on the exumbrella, the number and structure of marginal tentacles and the relative size and shape of the manubrium.

Distribution: Widespread and scattered in Indian and south-west Atlantic oceans. This is the first record from the west Indian Ocean, though previously recovered from India (Ganapati & Nagabhushanam 1958). Neritic.

Plotocnide incerta (Linko, 1900)

(*Syndiction*?) *incertum*: Linko 1900: 151, fig. 1.
Plotocnide incerta: Kramp 1959*a*: 91, fig. 46; 1961: 45.

Description: Single specimen. Bell-shaped umbrella, slightly taller than broad, with indistinct apical projection, broad, rounded; 1.5 mm in height. Exumbrella surface smooth, with irregularly scattered cnidocysts. Mesoglea thick. Velum broad. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor apical canals. With four perradial marginal tentacles arising from conspicuous bulbs on umbrella margin. Tentacles of similar size, short, typically coiled, solid, unbranched, filiform. Manubrium flask-shaped, occasionally extending beyond velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; on pronounced gastric peduncle. Without ocelli on bulb of marginal tentacles. Gonads simple, entirely encircling manubrium for much of length.

Material examined: H5045.

Comments: The systematic position of this genus is unresolved, and the generic identity of this particular species is still questioned (Bouillon & Boero 2000*b*). Unfortunately, the single specimen collected here cannot contribute to the debate.

Distribution: Boreal cold temperate and polar waters of Atlantic and Pacific oceans. This is the first record from the Indian Ocean and the southern Hemisphere. Neritic.

Family Tessieridae Bouillon, 1974

Tessiera medusifera Bouillon, 1978

Tessiera medusifera: Bouillon 1978*a*: 272–279, figs 14–16.

Description: Single specimen. Bell-shaped umbrella, slightly taller than broad, **with solid apical projection**, **transparent**; 1.3 mm in height. Exumbrella surface smooth, with cnidocysts in short club-like tracks above marginal bulbs. Mesoglea thick at apex, thinning laterally. Velum narrow. Peripheral canal and four narrow radial canals present, latter with smooth margin; with neither centripetal nor apical canals. With two (opposite) perradial marginal tentacles; each arising from very enlarged and pendulous bulb on umbrella margin. Tentaculate bulbs **orange**, with dense cnidophores on abaxial surface; atentaculate marginal bulbs minute and rudimentary. Tentacles of similar size, long, solid, unbranched but with numerous, regularly spaced abaxial cnidophores. Manubrium flask-shaped with quadrangular base, shorter than bell cavity, not connected to radial canals by mesenteries, **pale orange in colour**. Mouth simple, circular, may be cylindrical, without lips; without gastric peduncle. Without ocelli at apex of cnidocyst tracks. Gonads interradial, of moderate size; may have an incubation chamber apically (not seen on present specimen); developing medusoids may be present on manubrium.

Material examined: H5046.

Comments: Three species are considered to be valid (Bouillon & Boero 2000*b*), all of which appear to be restricted to the Indian Ocean. Although the only other species that has been recovered from the west Indian Ocean is *T. milleporoides* Bouillon, 1974 from Seychelles (Bouillon 1974), it is not unlikely—given the known distribution of the presently described specimen—that *T. australe* Bouillon, 1978 might also be found in the region. The species can be separated by the presence/absence of an apical projection to the bell; the colour of the bell, manubrium and the tentaculate bulbs.

Distribution: New Guinea. This is the first record from the west Indian Ocean. Neritic.

Subclass Leptomedusae Haeckel, 1879

Family Aequoreidae Eschscholtz, 1829

Aequorea forskalea Péron & Lesueur, 1810

Medusae aequorea: Forskål 1775: 110.
Aequorea forskalea: Péron & Lesueur 1810: 336; Kramp 1959*a*: 167, fig. 270; 1961: 203.

Description: 12 specimens from seven stations. Umbrella as slightly flattened hemisphere, broader than wide, without apical projection; up to 6.4 mm in diameter. Exumbrella surface smooth, without rows of gelatinous papillae. Mesoglea thick, with a lens-like central disk. Velum broad. Peripheral canal and **up to 160 radial canals** present, latter narrow, with smooth margin and unbranched; without centripetal canals. Up to **twice as many perradial tentacles** as radial canals; connected to peripheral canal, arising from conspicuous, elongated conical bulbs on umbrella margin. Tentacles of similar size, long, hollow, unbranched, filiform. **Few irregularly distributed rudimentary bulbs present at umbrella margin**. **Marginal bulbs without keel but with an excretory papilla**. Lateral and marginal cirri absent. Manubrium up to 1/2 umbrella width, broad and flat, not extending to velum, not connected to radial canals by mesenteries. Mouth simple, circular, with credulated lips; gastric peduncle absent. Statocysts closed; approx. twice as numerous as marginal bulbs. Without ocelli. **Gonads extending almost entire length of radial canals**; **essentially linear**, **not reaching to peripheral canal**.

Material examined: H5048.

Comments: Bouillon and Boero (2000*b*) recognise 16 named species of *Aequorea*. Aside from those described here, four others have been recorded from the Indian Ocean (Kramp 1961): *A. australis* Uchida, 1947 (from the Indo-West Pacific – Kramp 1965; Bouillon 1978*a*), *A. macrodactyla* (Brandt, 1835) ('from all parts of the Indian Ocean' – Kramp 1965; Bouillon 1978*b*), *A. coerulescens* (Brandt, 1938) (off the cost of India – Kramp 1965) and *A. parva* Browne, 1905 (from the coast of India – Ganapati & Nagabhushanam 1958). Species of *Aequorea* can be differentiated by examination of the number of radial canals, marginal tentacles, bulbs and statocysts. The overall shape of the umbrella and the thickness of the mesoglea, as well as the structure and distribution of the gonads, and the morphology of the tentacle bulbs can also be used to separate species.

Distribution: Worldwide in tropical and temperate coastal waters (but see Pagès *et al.* 1992). This species has previously been recorded off Durban and in the Mozambique Channel (Kramp 1965), as well as off the Seychelles (Bouillon 1978*b*). Neritic.

Aequorea globosa Eschscholtz, 1829

Aequorea globosa: Eschscholtz 1829: 110, pl. 10, fig. 2; Kramp 1961: 206; 1968: 99, fig. 271.

Description: Four specimens from three stations. Umbrella hemispherical, broader than wide, without apical projection; up to 6.4 mm in diameter. Exumbrella surface smooth, without rows of gelatinous papillae. Mesoglea thick, lens-like central disk. Velum narrow. Peripheral canal and **up to 40 radial canals** present, latter narrow, with smooth margin and unbranched; without centripetal canals. **With up to 40 perradial tentacles** connected to peripheral canal, arising from conspicuous, slightly conical bulbs on umbrella margin. Tentacles of similar size, long, hollow, unbranched, filiform. **Up to 80 small rudimentary bulbs present at umbrella margin**. **All marginal bulbs with neither keel nor excretory papillae**. Lateral and marginal cirri absent. Manubrium up to 1/2 umbrella width, broad and flat, not extending to velum, not connected to radial canals by mesenteries. Mouth simple, circular, with credulated lips; gastric peduncle absent. Statocysts closed, twice as numerous as marginal bulbs. Without ocelli. **Gonads extending almost entire length of radial canals**, **essentially linear**, **may be sinuous**, **closer to margin than stomach**.

Material examined: H5074.

Comments: see *A. forskalea*.

Distribution: Coastal waters of tropical and temperate Indo-West Pacific. This is the first record from the west Indian Ocean. Neritic.

Aequorea conica Browne, 1905

Aequorea conica: Browne 1905: 145, pl. 1, fig. 2; Kramp 1961: 206; 1968: 100, fig. 272.

Description: Ten specimens from four stations. Conical, domed umbrella, slightly taller than broad, without apical projection; up to 3 mm in diameter. Exumbrella surface smooth, without rows of gelatinous papillae. Mesoglea very thick, thinning slightly to margin. Velum narrow. Peripheral canal and up to **16 radial canals** present, latter narrow, with smooth margin and unbranched; without centripetal canals. **With 25–30 tentacles** connected to peripheral canal, arising from small, conical bulbs on umbrella margin. Tentacles of similar size, long, hollow, unbranched, filiform. **As many small rudimentary bulbs as marginal tentacles**. **All marginal bulbs without keel and with neither excretory papillae nor excretory pores**. Lateral and marginal cirri absent. Manubrium up to 1/2 umbrella width, broad and flat, not extending to velum, not connected to radial canals by mesenteries. Mouth simple, circular, with 16 credulated lips; gastric peduncle absent. Statocysts closed, twice as numerous as tentacles. Without ocelli. **Gonads rarely extending to half length of radial canals**; **sac-like**, **pendant**, **closer to stomach than margin**.

Material examined: H5049.

Comments: see *A. forskalea*.

Distribution: Widespread in tropical and temperate waters of Indo-West Pacific. Previously collected in the Mozambique Channel (Kramp 1965), off the Seychelles archipelagos (Bouillon 1978*b*) and from along the east coast of South Africa (Millard 1975). Neritic.

Aequorea pensilis (Eschscholtz, 1829)

Mesonema coelum pensile: Eschscholtz 1829: 112.
Aequorea pensilis: Kramp 1961: 208; 1968: 98, fig. 268.

Description: Five specimens from three stations. Saucer-shaped umbrella, much broader than tall, without apical projection; up to 6.3 mm in diameter. Exumbrella surface smooth, without rows of gelatinous papillae. Mesoglea thickened centrally, lens-like, thinning to margin. Velum narrow. Peripheral canal and between **100–250 radial canals present**, latter narrow, with smooth margin and unbranched; without centripetal canals. **With 10–16 tentacles** connected to peripheral canal, arising from small bulbs on umbrella margin. Tentacles of similar size, long, hollow, unbranched, filiform. **8–16 times as many small rudimentary bulbs as marginal tentacles**. **All marginal bulbs with lateral extensions**; without either keel or excretory papillae, **but bearing excretory pores**. Lateral and marginal cirri absent. Manubrium up to 2/3 umbrella width, broad and flat, not extending to velum, not connected to radial canals by mesenteries. Mouth simple, circular, without pronounced lips; gastric peduncle absent. Statocysts closed, numerous. Without ocelli. **Gonads extending along almost entire length of radial canals**.

Material examined: H5050.

Comments: see *A. forskalea*.

Distribution: Widespread in tropical and temperate waters of Indo-West Pacific. Previously collected in the Mozambique Channel, off the Seychelles archipelagos and along the east coast of South Africa (Kramp 1965; Millard 1975; Bouillon 1978*b*), and in the Benguela Current along the west coast of South Africa (Vanhöffen 1911). Neritic.

Zygocanna buitendijki Stiasny, 1928

Zygocanna buitendijki: Stiasny 1928: 218–224, figs 5, 6; Kramp 1961: 210; 1968: 101, fig. 275.

Description: Six immature specimens from single station. Umbrella as flattened hemisphere, much broader than tall, without apical projection; 1.9 mm in diameter. Exumbrella surface with numerous, relatively indistinct radiating ribs; without gelatinous papillae. Mesoglea thickened centrally, thinning to margin. Velum narrow. Peripheral canal and **16 radial canals present**, **latter narrow**, **with smooth margin**; **much branched**; without centripetal canals. **With 16 tentacles connected to peripheral canal**, arising from small heart-shaped bulbs on umbrella margin. Tentacles of similar size, long, hollow, unbranched, filiform. Without small rudimentary bulbs or secondary tentacles. All marginal bulbs without either lateral extensions or keel, excretory papillae present. Lateral and marginal cirri absent. Manubrium up to 1/2 umbrella width, broad and flat, not extending to velum, not connected to radial canals by mesenteries. Mouth simple, circular, without lips; gastric peduncle absent. Statocysts closed, numerous. Without ocelli. When mature, gonads extending along distal portion of radial canals, but not reaching peripheral canal.

Material examined: H5051.

Comments: Although species of *Zygocanna* appear to be largely confined to the Indo-Pacific, only one other has been recorded from the region – *Z. vagans* Bigelow, 1912, off the Cape of Good Hope (Kramp 1957, 1965). Species can be differentiated by the number of ribs or papillar rows on the exumbrella surface, the number of radial canals and their degree of branching. The present material lacked marginal bulbs (as Bouillon 1984: 25), but is clearly recognisable by the small number of marginal tentacles and large number of radial canals.

Distribution: Indo-Malayan area. This is the first record from the west Indian Ocean, though it has been recorded along the coast of India (see records in Kramp 1961). Neritic.

Family Blackfordiidae Bouillon, 1984

Blackfordia virginica Mayer, 1910

Blackfordia virginica: Mayer 1910: 277, pl. 36, figs 3–5; Kramp 1961: 181; 1968: 85, fig. 228.

Description: Single specimen. Domed umbrella, slightly taller than broad, without apical projection; 4 mm in diameter. Exumbrella surface smooth. Mesoglea thick, thinning to margin. Velum narrow. Peripheral canal and four radial canals present, latter narrow, with smooth margin and unbranched; without centripetal canals. With approx. 100 tentacles connected to peripheral canal, arising from small bulbs on umbrella margin. Endoderm of tentacles extend inwards to mesoglea at margin. Tentacles of similar size, long, hollow, unbranched, filiform. With no atentaculate marginal bulbs. All marginal bulbs without keel, and with neither excretory pores nor excretory papillae. Lateral and marginal cirri absent. Manubrium narrow, short, not extending to velum, not connected to radial canals by mesenteries. Mouth simple, circular, with four slightly recurved, crenulated lips; gastric peduncle absent. **Statocysts closed**, **one between each marginal tentacle**. **Without ocelli**. **Gonads linear**, **sinuous**, **completely surround radial canals**, **rarely extending more than half radial canal length**.

Material examined: H5052.

Comments: Three named species are recognised by Bouillon and Boero (2000*b*). They differ in the distribution of their gonads, and in the number and structure of their statocysts. The other two species have not, to date, been recovered from the Indian Ocean.

Distribution: Widespread in temperate and subtropical waters, including coastal Brazil (Paranaguá 1963), Mediterranean Sea and Black Sea. A known invasive species into North America (Mills & Rees 2000) and India (Carlton 1985). This is the first record from the west Indian Ocean. Neritic.

Family Eirenidae Haeckel, 1879

Eirene menoni Kramp, 1953

Eirene menoni: Kramp 1953: 286, pl. 2, fig. 6; 1961: 189; 1968: 90, fig. 242.

Description: Ten specimens from five stations. **Hemispherical**, **domed umbrella**, slightly taller than broad, without apical projection; up to 10 mm in diameter. Exumbrella surface smooth. Mesoglea thick, thinning to margin. Velum narrow. Peripheral canal and **up to six radial canals present**, radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. **With up to 30 tentacles connected to peripheral canal**, **arising from swollen bulbs on umbrella margin**. **Tentacles generally short**, **slender**, hollow, unbranched, filiform. **With no atentaculate marginal bulbs**. All marginal bulbs without keel, and **with neither excretory pores nor excretory papillae**. Lateral and marginal cirri absent. Manubrium short, not connected to radial canals by mesenteries. **Mouth simple**, **with four slightly recurved**, **crenulated lips**; **gastric peduncle pronounced**, **narrow**, **with conical base**. **Statocysts closed**, **numerous**. Without ocelli. Gonads linear, may be sinuous, variably extending along subumbrella surface of radial canals.

Material examined: H5053.

Comments: Eighteen species are currently considered to be valid (Bouillon & Boero 2000*b*). Excluding the currently described material, three other species have been recorded from the west Indian Ocean, including *E. ceylonensis* Browne, 1905 (off Natal – Kramp 1965), *E. palkensis* Browne, 1905 (off Natal – Vanhöffen 1912) and *E. hexanemalis* (Goette, 1886) (Kramp 1965; Millard 1975; Bouillon 1978*b*). A further four are known from elsewhere in the Indian Ocean: *E. elliceana* (Agassiz & Mayer, 1902), *E. kambara* Agassiz & Mayer, 1899, *E. pyramidalis* (L. Aggassiz, 1862) and *E. tenuis* (Browne, 1905). Species of *Eirene* can be distinguished (with difficulty) on the shape and consistency of their umbrella, the size and shape of the gastric peduncle, and the number and length of the marginal tentacles and atentaculate marginal bulbs. The number and shape of oral lips can also be important, as can the presence/absence of excretory papillae/pores associated with tentacle bulbs. *E. hexanemalis* is identifiable by its somewhat flattened umbrella and the presence of up to six radial canals (and oral lips); the gastric peduncle is pronounced, thick, with conical base. It also has between 30–50 short tentacles that arise from large, swollen bulbs with excretory papillae. *E. palkensis* possesses three times as many atentaculate than tentaculate marginal bulbs, all of which have obvious excretory papillae. Specimens have up to 50 tentacles and the gonads extend along almost the entire length of the radial canals from the gastric peduncle. *E. ceylonensis* is characterised by its slender gastric peduncle and elongated gonads that extend from the manubrium to the umbrella margin. This species also has few atentaculate marginal bulbs, pronounced excretory papillae and more than 100 marginal tentacles.

Distribution: Widespread in tropical and subtropical waters of the Indo-West Pacific. Previously collected from along the coast of south-east Africa (Kramp 1965; Millard 1975). Neritic.

Eirene viridula (Péron & Lesueur, 1810)

Oceania viridula: Péron & Lesueur 1810: 346.
Eirene viridula: Kramp 1961: 191; 1968: 90, fig. 243.

Description: Ten specimens from four stations. **Hemispherical umbrella**, slightly taller than broad, without apical projection; up to 12.5 mm in diameter. Exumbrella surface smooth. Mesoglea thick, thinning to margin. Velum narrow. Peripheral canal and **four radial canals present**, radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. **With up to 40 tentacles** connected to peripheral canal, **arising from small conical bulbs** on umbrella margin. **Tentacles of variable size**, **generally small**, hollow, unbranched, filiform. **With no atentaculate marginal bulbs**. All marginal bulbs without keel, but **with excretory papillae**. Lateral and marginal cirri absent. Manubrium short, not connected to radial canals by mesenteries. **Mouth simple**, **quadrate**, **with four slightly recurved**, **crenulated lips**; **gastric peduncle pronounced**, **slender**, **with pyramidal base**. Statocysts closed, numerous. Without ocelli. Gonads linear, may be sinuous, **extending along much of length of subumbrella surface of radial canals**, **not reaching to gastric peduncle**.

Material examined: H5054, H5055.

Comments: see *E. menoni*.

Distribution: Widespread in tropical and warm temperate waters of the Atlantic and Indian oceans; Mediterranean Sea. This is the first record from the south-west Indian Ocean, though previously reported from Djibouti (Ranson 1933). Neritic.

Eutima ?commensalis Santhakumari, 1970

Eutima ?commensalis: Santhakumari 1970: 114–118, figs 2–6.

Description: Two specimens from two stations. Umbrella hemispherical, dome-shaped, as broad as tall; without apical projection; up to 5.3 mm in diameter. Exumbrella surface smooth. Mesoglea thick. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. **With eight tentacles** (four perradial, four interradial) connected to peripheral canal, arising from slightly swollen, linear bulbs on umbrella margin. Tentacles long (perradial longer than interadial), hollow, unbranched, filiform. With approx. 30 small, atentaculate marginal swellings or warts (appear to be four per octant, which may be lost on preservation). All marginal bulbs and warts without keel, and with neither excretory papillae nor excretory pores; lateral cirri present. Manubrium short, not connected to radial canals by mesenteries. Mouth simple, quadrate, with four lips. **Gastric peduncle short**, **slender**, **tapering**, **reaching to level of velum**. Statocysts closed, eight in number (two per quadrant). Without ocelli. **With four gonads**; **thick**, **linear**, **may be sinuous**, **extending from bell margin**, **along length of subumbrella surface of radial canals and onto gastric peduncle**.

Material examined: H5056.

Comments: Nineteen medusae are considered valid by Bouillon and Boero (2000*b*), nine of which have previously been recovered from the Indian Ocean (Kramp 1961, 1965): *E. japonica* Uchida, 1925, *E. curva* Browne, 1905, *E. gegenbauri* (Haeckel, 1864), *E. hartlaubi* Kramp, 1958, *E. levuka* (Agassiz & Mayer, 1899), *E. mira* McGrady, 1857, *E. modesta* (Hartlaub, 1909), *E. mucosa* Bouillon, 1984, and *E. orientalis* (Browne, 1905). Although most species can generally be distinguished by the number of marginal tentacles and bulbs, and the number, and distribution, of the gonads and the relative length of the gastric peduncle—and both Santhakumari (1970) and Bouillon (1984) usefully tabulate the morphological characteristics of each species—the medusa of *E. commensalis* is very similar to that of *E. japonica*. Indeed, mature specimens can only really be separated if they are in excellent condition and have undamaged umbrella margins; *E. japonica* has up to 32 marginal warts and *E. commensalis* has up to 48 warts. In tentatively assigning these specimens to *E. commensalis* we take cogniscence of the fragility of the marginal warts and hence the possibility of their loss during collection and preservation, and are guided by the conclusions of Kubota (2000). We also recognise that *E. japonica* is restricted to the North Pacific Ocean.

Distribution: North Indian Ocean, Arabian Sea. Epipelagic. Neritic. This is the first record from the south-west Indian Ocean.

Eutima curva Browne, 1905

Eutima curva: Browne 1905: 138, pl. 3, figs 1–3, Kramp, 1961: 195; 1968: 96, fig. 259.

Description: Single slightly damaged specimen. Dome-shaped umbrella, slightly broader than tall, without apical projection; 8 mm in diameter. Exumbrella surface smooth. Mesoglea thick. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. **With four perradial tentacles** connected to peripheral canal, arising from slightly swollen (especially abaxially), linear bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. **With approx**. **140 small**, **atentaculate marginal swellings or warts**. All marginal bulbs and warts without keel, and with neither excretory papillae nor excretory pores; lateral cirri present. Manubrium short, flask-shaped, not connected to radial canals by mesenteries. Mouth simple, quadrate, with four crenulated lips. **Gastric peduncle pronounced**, **as long as umbrella width**, pyramid-shaped proximally, prismatic distally. Statocysts closed, eight in number (two per quadrant). Without ocelli. **With four gonads on distal portion of gastric peduncle**.

Material examined: H5057.

Comments: see *E. ?commensalis*.

Distribution: Scattered in tropical and subtropical waters of Indo-West Pacific. This is the first record from the south-west Indian Ocean, though it has been recorded off Sri Lanka (Browne 1905). Neritic.

Eutima gegenbauri (Haeckel, 1864)

Octorchis gegenbauri: Haeckel 1864: 331.
Eutima gegenbauri: Kramp 1959*a*:161, fig. 221; 1961: 195.

Description: 13 specimens from single station; in poor condition. Bell-shaped umbrella, slightly taller than broad, without apical projection; up to 12 mm in diameter. Exumbrella surface smooth. Mesoglea thickened apically, thinning to margin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. With **8 tentacles** connected to peripheral canal, arising from slightly swollen, linear bulbs on umbrella margin. Tentacles of similar length, long, hollow, unbranched, filiform. **With up to 80 small**, **atentaculate marginal swellings or warts**. All marginal bulbs and warts without keel, but with excretory papillae adaxially; lateral cirri present. Manubrium short, flask-shaped, not connected to radial canals by mesenteries. Mouth simple, quadrate, with four short, slightly crenulated lips (damaged in specimens on hand). **Gastric peduncle pronounced**, **longer than umbrella diameter**, with broad prismatic base, tapering distally. Statocysts closed, eight in number (two per quadrant). Without ocelli. **With eight gonads**; **linear**, **may be sinuous**, **four on gastric peduncle**, **and four extending from gastric peduncle along much of length of subumbrella surface of radial canals**.

Material examined: H5073.

Comments: see *E. ?commensalis*.

Distribution: Widespread in temperate waters of the north-east Atlantic Ocean and Mediterranean Sea. This is the first record from the west Indian Ocean, though Bouillon (1984) notes it as found off Sri Lanka. Neritic.

Eutima levuka (Agassiz & Mayer, 1899)

Eutimeta levuka: Agassiz & Mayer 1899: 163, pl. 9, figs 30, 31.
Eutima levuka: Kramp 1961: 197; 1968: 95, fig. 257.

Description: Eight specimens from five stations. Umbrella as flattened hemisphere, slightly broader than tall, without apical projection; up to 9 mm in diameter. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. With **eight tentacles** connected to peripheral canal, arising from slightly swollen, linear bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform, characteristically banded. **With more than 80 small**, **atentaculate marginal swellings or warts**. All marginal bulbs and warts without keel and with neither excretory pores nor excretory papillae; lateral cirri present. Manubrium short, flask-shaped, not connected to radial canals by mesenteries. Mouth simple, with four short, slightly crenulated and recurved lips. **Gastric peduncle pronounced**, **longer than bell diameter**, with narrow base, tapering distally. Statocysts closed, eight in number (one between each tentacle). Without ocelli. **With eight gonads**; **linear**, **may be sinuous**, **four on gastric peduncle**, **and four extending from gastric peduncle along much of length of subumbrella surface of radial canals**.

Material examined: H5072.

Comments: see *E.* ?*commensalis*.

Distribution: Widespread in tropical and subtropical Pacific Ocean. Previously reported from the coast of south-east Africa (Kramp 1965; Millard 1975) and in the Mozambique Channel (Bouillon 1978*b*). Neritic.

Eutima mira McCrady, 1859

Eutima mira: McCrady 1859: 190, pl. 11, figs 8, 9; Kramp 1959: 161, fig. 222; 1961: 198.

Description: Three specimens from single station. Dome-shaped umbrella, as broad as tall, without apical projection; up to 3.8 mm in diameter. Exumbrella surface smooth. Mesoglea thick, thinning to margin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. With **four tentacles** connected to peripheral canal, arising from slightly swollen, linear bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. **With up to 100 small**, **atentaculate marginal swellings or warts**. All marginal bulbs and warts without keel, and with neither excretory papillae nor excretory pores; lateral cirri present. Manubrium short, flask-shaped, not connected to radial canals by mesenteries. Mouth simple, quadrate, with four recurved, slightly crenulated lips. **Gastric peduncle very pronounced**, **slender**, **tapering**, **twice as long as umbrella width**. Statocysts closed, eight in number (two per quadrant). Without ocelli. **With eight gonads**; **linear**, **may be sinuous**, **four on gastric peduncle**, **and four extending from gastric peduncle along much of length of subumbrella surface of radial canals**.

Material examined: H5058.

Comments: see *E.* ?*commensalis*.

Distribution: Widespread but scattered in tropical and temperate waters of the Atlantic Ocean. Previously collected off the Seychelles archipelagos (Bouillon 1978*b*). Neritic.

Tima bairdi (Johnston, 1833)

Dianaea bairdii: Johnston 1833: 320, fig. 41.
Tima bairdi: Russell 1953: 380, figs 246–249; Kramp 1959*a*: 164, fig. 228; 1961: 202.

Description: Three immature specimens from three stations. Dome-shaped, hemispherical umbrella, slightly taller than broad, without apical projection; up to 7.5 mm in diameter. Exumbrella surface smooth. Mesoglea thick. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched, extending from umbrella margin across underside of bell and along gastric peduncle to manubrium; without centripetal canals. **With up to 16 tentacles** connected to peripheral canal, arising from slightly swollen bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. **With up to 200 small**, **atentaculate marginal swellings or warts** (approx. 12 between each tentacle). All tentacle bulbs and warts with neither excretory papillae nor excretory pores; lateral cirri absent; tentacle bulbs with an adaxial spur. Manubrium short, flask-shaped, not connected to radial canals by mesenteries. Mouth simple, quadrate, with four large crenulated lips. Gastric peduncle very pronounced, thick, with a broad base, tapering distally, as long as umbrella width. Statocysts closed, numerous. Without ocelli. With four gonads, linear, extending from gastric peduncle along subumbrella surface of radial canals.

Material examined: H5059.

Comments: Four species are considered by Bouillon and Boero (2000*b*) to be valid. These can be separated readily by examination of the number of tentacles and marginal warts.

Distribution: Scattered in temperate waters of north-west Atlantic Ocean and tropical Indo-West Pacific Ocean (van der Spoel & Bleeker 1988). This is the first record from the Indian Ocean. Neritic.

Family Laodiceidae Agassiz, 1862

Laodicea fijiana Agassiz & Mayer, 1899

Laodicea fijiana: Agassiz & Mayer 1899: 163, pl. 3, figs 9, 10; Kramp 1961: 140; 1968: 66, fig. 171.

Description: Two specimens from two stations. Saucer-shaped umbrella, much broader than tall, without apical projection; up to 2.5 mm in diameter. Exumbrella surface smooth. Mesoglea thin, but rigid. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched; without centripetal canals. With **more than 60 marginal tentacles** connected to peripheral canal, arising from small, slightly swollen bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. Margin without atentaculate swellings or warts; marginal cirri absent. **Tentacle bulbs without spurs or lateral cirri**, excretory papillae or pores absent. **Cordyli present**, **few in number**, **irregularly distributed between tentacles**. Manubrium quadrate, small, **bearing short perradial lobes**, not connected to radial canals by mesenteries. Mouth simple, short, quadrate, with slightly crenulated lips. Gastric peduncle absent. Without statocysts. **With ocelli on some tentacular bulbs**. With four gonads, sinuous and folded, arising from complex lateral diverticula on subumbrella surface of radial canals, extending from manubrium along variable length of radial canals.

Material examined: H5060, H5061.

Comments: Seven species are recognised as valid by Bouillon and Boero (2000*b*). These can be separated by the relative size of the gastric lobes, by the number of tentacles and cordyli, and by the presence/absence of abaxial spurs on the marginal bulbs. Ocelli may be present or absent. Only *L. undulata* (Forbes and Goodsir, 1851) has previously been recorded from the Indian Ocean.

Distribution: Fiji Archipelago. This is the first record from the Indian Ocean. Neritic.

Laodicea pulchra Browne, 1902

Laodicea pulchra: Browne 1902: 280; Kramp 1961: 141; 1968: 66, fig. 170.

Description: Three specimens from two stations. Umbrella as flattened hemisphere, broader than tall, without apical projection; up to 5.4 mm in diameter. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched; without centripetal canals. **With up to 50 marginal tentacles** connected to peripheral canal, arising from small, slightly swollen bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. Margin without atentaculate swellings or warts; marginal cirri absent. **Tentacle bulbs without basal spurs**, without excretory papillae or pores; lateral cirri absent. **Cordyli present**, **arranged in clusters of 3–4 between tentacles**. Manubrium fairly large, **bearing four large perradial lobes that extend more than half-way to bell margin**, not connected to radial canals by mesenteries. Mouth simple, broad, with four slightly crenulated lips. Gastric peduncle absent. Without statocysts. **With ocelli on each tentacular bulb and cordylus**. With four gonads, sinuous and folded, extending from centre of manubrium along entire length of subumbrella surface of radial canals.

Material examined: H5063, H5064.

Comments: Although this is typically considered a sub-Antarctic species, the combination of highlighted features (above) is diagnostic.

Distribution: Cold temperate waters of Southern Hemisphere. This is the first record from the west Indian Ocean. Neritic.

Laodicea undulata (Forbes & Goodsir, 1851)

Thaumantias undulata: Forbes & Goodsir 1851: 313, pl. 10, fig. 7.
Laodicea undulata: Kramp 1959*a*: 136, fig. 153; 1961: 141.

Description: Two specimens from two stations. Umbrella as flattened hemisphere, broader than tall, without apical projection; up to 7.8 mm in diameter. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, with smooth margin, unbranched; without centripetal canals. **With approx**. **200 marginal tentacles** connected to peripheral canal, arising from small, slightly swollen bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. Margin without atentaculate swellings or warts, but **marginal cirri may be present** (tend to get lost on preservation). **Tentacle bulbs with abaxial spur**, **without excretory papillae or pores**; **lateral cirri absent**. **Cordyli present**, **arranged singly between tentacles**. Manubrium quadrate, small, **bearing short**

perradial lobes, not connected to radial canals by mesenteries. Mouth simple, short, quadrate, with slightly crenulated lips. Gastric peduncle absent. Without statocysts. **With ocelli on some tentacular bulbs**. With four gonads, sinuous and folded, extending from manubrium along entire length of subumbrella surface of radial canals.

Material examined: H5062, H5065.

Comments: see *L. fijiana*.

Distribution: Widespread in tropical and temperate waters of Atlantic and Pacific oceans. Previously recorded by Millard (1975) from along the east coast of South Africa. Recorded as *L. indica* from along the south-east coast of Africa (Kramp 1965; Millard 1975) and in the Mozambique Channel (Bouillon 1978*b*). Epi- and mesopelagic.

Toxorchis polynema Kramp, 1959

Toxorchis polynema: Kramp 1959*a*: 34, 141, pl. 1, fig. 13, pl. 2, fig. 4; 1961: 150; 1968: 70, fig. 186; Bouillon 1984: 74, fig. 21.

Description: Single specimen. Umbrella saucer-shaped, much broader than tall, without apical projection; 4.7 mm in diameter. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and **four radial canals present**; **radial canals each bifurcating twice on manubrium**, narrow, reaching to circular canal; without centripetal canals. **With more than 200 marginal tentacles** connected to peripheral canal, arising from small, slightly swollen bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. Endoderm of tentacles extend inwards to mesoglea at margin. Margin without atentaculate swellings or warts; marginal cirri absent. Tentacle bulbs without abaxial spurs, without excretory papillae or pores; lateral cirri absent. **Cordyli present**, **arranged irregularly between tentacles**. Manubrium quadrate, flat, with broad cruciform base, without perradial lobes, not connected to radial canals by mesenteries. Mouth short, quadrate, with crenulated lips. Gastric peduncle absent. Without statocysts. With ocelli on some tentacular bulbs. Gonads broad and sinuous, extending along proximal length of subumbrella surface of radial canals.

Material examined: H5067.

Comments: Five species are recognised as valid by Bouillon and Boero (2000*b*). These can be readily distinguished by the number of tentacles, cordyli and radial canals, and by the degree of branching of the radial canals.

Distribution: Worldwide in tropical and subtropical waters. Previously recorded from the east coast of Africa (Kramp 1965). Epi- and mesopelagic.

Family Lovenellidae Russell, 1953

Eucheilota paradoxica Mayer, 1900

Eucheilota paradoxica: Mayer 1900*b*: 56, pl. 40, figs 134–136; 1910: 285, pl. 37; Kramp 1961: 175.

Description: Six specimens from three stations. Umbrella essentially hemispherical, taller than broad; may have small apical projection; up to 2.3 mm in height. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, unbranched; without centripetal canals. **With four perradial marginal tentacles** connected to peripheral canal, arising from swollen, conical bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. **Margin**

with atentaculate swellings or rudimentary bulbs; marginal cirri absent. **Marginal bulbs without spurs**, without excretory papillae or pores; **lateral cirri present**. Manubrium flask-shaped, narrow, short and not reaching to velum, without perradial lobes, not connected to radial canals by mesenteries, unpigmented. Mouth simple, with slightly crenulated lips. Gastric peduncle absent. **With eight**, **closed statocysts**. **Without ocelli on tentacular bulbs**. Four gonads, swollen, situated along middle portion of subumbrella surface of radial canals, not reaching to manubrium; may support medusa buds.

Material examined: H5068.

Comments: Seventeen species are recognised by Bouillon and Boero (2000*b*). These can be separated by examination of the number of statocysts, tentacles, marginal bulbs and cirri. Two other species are known from the Indian Ocean: *E. menoni* Kramp, 1959 has been recorded off India (Menon 1932), Mozambique and the Seychelles (Kramp 1965), and *E. ventricularis* McCrady, 1857 was identified by Kramp (1959*c*) in the Gulf of Siam.

Distribution: Widespread but scattered in tropical and subtropical waters. Previously recorded by Bouillon (1978*b*) from around the Seychelles and in the Mozambique Channel. Neritic.

Family Mitrocomidae Haeckel, 1879

Cosmetirella davisi (Browne, 1902)

Tiaropsis davisii: Browne 1902: 281.
Cosmetirella davisi: Kramp 1959*a*: 144, fig. 176; 1961: 152.

Description: Two specimens from two stations. Umbrella hemispherical, slightly broader than tall, without apical projection; up to 7.7 mm in diameter. Exumbrella surface smooth. Mesoglea thin. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, unbranched; without centripetal canals. With 96 marginal tentacles connected to peripheral canal, arising from slightly swollen bulbs on umbrella margin. Tentacles long, hollow, unbranched, filiform. Margin without atentaculate swellings or rudimentary bulbs; marginal cirri absent. Tentacle bulbs without spurs, without excretory papillae or pores; lateral cirri absent. Manubrium flask-shaped, with narrow base, extending perradially, short and not reaching to velum, without perradial lobes, not connected to radial canals by mesenteries. Mouth simple, short, with slightly crenulated lips. Gastric peduncle absent. With eight, open statocysts. Without ocelli on tentacular bulbs. Four gonads, linear, may be sinuous, extend along subumbrella surface of radial canals, for up to 2/3 length, not reaching to manubrium.

Material examined: H5069.

Comments: This is the only species in this genus.

Distribution: Worldwide in cold temperate and polar waters. This is the first record from the west Indian Ocean, though it has been reported south of the Cape of Good Hope (Kramp 1957) and along the west coast of South Africa (Millard 1975). Neritic.

Mitrocomella grandis Kramp, 1965

Mitrocomella grandis: Kramp 1965: 57, fig. 2; 1968: 72, fig. 189; Pagès *et al*. 1992: 30, fig. 32.

Description: Three specimens from two stations. Umbrella saucer-shaped, hemispherical, much broader than tall, without apical projection; up to 6.6 mm in diameter. Exumbrella surface smooth. Mesoglea thick centrally, thinning laterally. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, unbranched; without centripetal canals. **With up to 220 marginal tentacles**, similar, connected to peripheral canal, arising from small, slightly swollen bulbs on umbrella margin. Tentacles short, hollow, unbranched, filiform. Margin without atentaculate swellings or rudimentary bulbs; **marginal cirri present**, **numerous**, coiled. Tentacle bulbs without spurs, without excretory papillae or pores; lateral cirri absent. **Manubrium cruciform**, extending perradially, short and not reaching to velum, without perradial lobes, not connected to radial canals by mesenteries. Mouth simple, short, with four highly crenulated lips. Gastric peduncle absent. With 16 open statocysts. Without ocelli on tentacular bulbs. **Four gonads**, **linear**, **may be sinuous**, **extend along subumbrella surface of radial canals for almost entire length**, **not reaching to manubrium**.

Material examined: H5070.

Comments: Nine species are recognised as valid by Bouillon and Boero (2000*b*), and Pagès *et al*. (1992) have tabulated the characteristic features of eight of these. Species can be distinguished by the number of marginal tentacles, by the shape and size of the manubrium and by the distribution and structure of the gonads. No other species have been recorded from the Indian Ocean.

Distribution: Temperate waters of Benguela Current. This is the first record from the Indian Ocean. Neritic.

Family Malagazziidae Bouillon, 1984

Malagazzia carolinae (Mayer, 1900)

Phialucium carolinae: Mayer 1900*a*: 7, pl. 3, fig. 9, pl. 4, figs 10, 11; Kramp 1959*a*: 157, fig. 212; 1961: 185.

Malagazzia carolinae: Bouillon 1984: 77, pls 1, 2, 6.

Description: Single specimen, damaged. Umbrella hemispherical, dome-shaped, slightly broader than tall, without apical projection; 4.6 mm in diameter. Exumbrella surface smooth. Mesoglea thickened apically. Velum narrow. Peripheral canal and four radial canals present; radial canals narrow, unbranched; without centripetal canals. Only five **marginal tentacles** visible (generally **with up to 16–20**), similar, connected to peripheral canal, arising from large, swollen, conical bulbs on umbrella margin. Tentacles short and thick, hollow, unbranched, filiform, **with 3 small atentaculate swellings or rudimentary bulbs between tentacles**. Marginal cirri absent. Marginal bulbs without spurs but with adaxial excretory papillae; lateral cirri absent. Manubrium flask-shaped, narrow, short and not reaching to velum, without perradial lobes, not connected to radial canals by mesenteries. Mouth simple, short, with four slightly crenulated lips. Gastric peduncle absent. **With 64 closed statocysts**. Without ocelli on tentacular bulbs. **Four gonads**, **slightly sinuous**, **not surroundind completely the radial canals distally**, **not reaching to manubrium**.

Material examined: H5071.

Comments: Six species are recognised as valid by Bouillon and Boero (2000*b*), and two others have been recorded in the Indian Ocean: *M. multitentaculatum* (Menon, 1932) was recorded by Bouillon (1988*a*) off the Seychelles, whilst *M. taeniogonia* (Chow & Huang, 1958) has been recorded in the Mozambique Channel and off the

Seychelles (Bouillon 1978*b*). Species can be distinguished by the number of tentacles, rudimentary marginal bulbs and statocysts, as well as by the arrangement of the gonads: *M. multitentaculatum* has 25–32 tentacles and 3–4 rudimentary bulbs between tentacles, and the gonads are found along almost the entire length of the four radial canals. *M. taeniogonia* generally has eight marginal tentacles and 3–8 rudimentary bulbs between successive tentacles, and the gonads are considered to be slightly twisted and ribbon-like near the umbrella margin.

Distribution: World-wide in tropical and subtropical waters. Previously collected from around the Seychelles (Bouillon 1978*b*) and in the Mozambique Channel (Kramp 1965). Neritic.

DISCUSSION

The samples examined here have provided us with a rare opportunity to investigate the medusae from along the east coast of South Africa. Although they represent a first detailed examination of the fauna, it should be realised that the samples were not originally collected for their gelatinous zooplankton, but rather for ichthyoplankton (Beckley & van Ballegooyen 1992). As a consequence, they were neither collected using appropriate techniques, nor fixed and preserved in the most suitable manner (Petersen 1976). There was also a 12 year interval between collection and identification. During this period of time mechanical damage, distortion and shrinkage could occur (de Lafontaine & Leggett 1989). All of these make identification difficult. Nevertheless, we were able to identify 93% of the individuals collected from a total of 4166 medusae.

TABLE 1

Brief overview of results. Mean no. stations – the mean number of stations where a species of a particular order occurs; Mean no. indivs – average number of individuals per species; Tropical – distribution between 0° and 20° north and south; Warm temperate – distribution between 20° and 40° north and south; Cold temperate – distribution between 40° and 60° north and south; Polar – distribution for latitudes higher than 60° north and south; New Indian – new records for the Indian ocean; Pan-Oceanic – cosmopolitan species occurring in the three main oceans; Indo-Atlantic – species occurring in the Indian and Atlantic oceans; Indo-Pacific – species occurring in the Indian and Pacific oceans; C. temp. & polar – species distributed in the cold temperate and polar latitudes > 40° north and south; W. temp. & tropical – species distributed between 0° and 40° north and south; Extralimital – species distributed outside their original distribution area; Indian only – species distributed only in the Indian Ocean.

Taxa	Narcomedusae	Trachymedusae	Anthomedusae	Leptomedusae	All Groups
Mean no. stations	7.09	49.80	3.85	2.55	7.49
Mean no. indivs	16.91	682.60	6.59	4.91	59.77
Total no. species	11	5	27	22	65
New Records	2	1	15	11	29
Indian	10	5	22	18	55
Atlantic	10	5	13	13	41
Pacific	9	5	20	17	51
Tropical	11	5	25	16	57
Warm temperate	11	5	22	18	56
Cold temperate	6	1	9	10	26
Polar	5	0	1	2	8
New Indian	1	0	5	5	11
Pan-Oceanic	9	5	11	9	34
Indo-Atlantic	1	0	2	4	7
Indo-Pacific	0	0	9	9	18
C. temp. & polar	6	1	9	10	26
W. temp. & tropical	11	5	26	20	62
Extralimital	0	0	1	2	3
Indian only	1	0	5	0	6

On average, each species was represented by 60 individuals (Table 1). However, the five species of Trachymedusae dominated the collection and made up nearly 88% of all the individuals identified. By contrast, the Antho- and Leptomedusae represented more than 90% of the diversity found during the surveys but each occurred in low densities (Table 1). For example, of the 30 new records for the region, half were Anthomedusae which occurred in low densities at less than four stations. The diversity and abundance of the different orders of hydromedusae is linked to their life-cycle (Bouillon & Boero 2000*b*). Meroplanktic species tend to be more more diverse than holopelagic species.

The fauna appears to be characterised by cosmopolitanism. Such is to be expected for the holoplanktic forms, which can properly be described as panoceanic, but it is also obvious for many of the meroplanktic species. Some of these have long been known to be widely distributed though there is evidence that others might be more recent arrivals (e.g. *Blackfordia virginica*). Clearly much of the fauna has an Indo-Pacific affinity, though only five species of Anthomedusae and one species of Narcomedusae are restricted to the Indian Ocean.

Most of the species have an affinity for warm temperate and tropical waters, which is no surprise given the subtropical nature of the warm Agulhas Current. It is interesting to note however that eight species are also known from polar waters. Most of these latter forms are again members of the holozooplankton, and those that are not (*Plotocnide incerta*, *Laodicea pulchra* and *Cosmetirella davisi*) provide some evidence to support the presence of cool water inshore along the east coast (as e.g. Thibault-Botha & Gibbons 2005).

In their review of zooplankton diversity around southern Africa, Gibbons and Hutchings (1996) noted that west coast assemblages are characterised by a low diversity and a high biomass that reflects the elevated productivity of the region. By contrast, east coast zooplankton assemblages were shown to have a relatively high diversity and low biomass, which mirrors the generally low levels of productivity. A total of 80 species of hydromedusae have been recorded from over 1500 samples collected at various times of year along the west coast of southern Africa between the Cape of Good Hope and Walvis Bay (Pagès *et al*. 1992; Buecher & Gibbons 2000). By contrast, the 65 species found in this east coast survey were collected from 106 samples over a relatively short length of coastline. We can easily imagine an increase in the diversity of regional hydromedusae as observations get extended into neighbouring regions. The various studies that have hitherto been conducted on regional Hydromedusae suggest that a total of 112 different species (24 species are commune to the two coasts) can be found, which represents more than 14% of the world diversity. This proportion is less than has been noted for many other zooplankton taxa (Gibbons 1999), and implies that many more species are likely to be recovered in the future.

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